URBAN ENVIRONMENTS

In the development of the modern environmental movement in the 1960s and 1970s, it was fashionable to consider everything about cities bad and everything about wilderness good.

Cities were viewed as polluted, dirty, lacking in wildlife and native plants, and artificial—therefore bad. Wilderness was viewed as unpolluted, clean, teeming with wildlife and native plants, and natural—therefore good.

Today almost half of the world’s population is urban, and the forecasts are that in just 20 years—by 2030—almost two-thirds of the people will live in cities and towns.

As a consequence, if the environment of a city declines, almost certainly the environment of its surroundings will also decline.

The reverse is also true.

Cities also export waste products to the countryside, including polluted water, air, and solids.

The average city resident in an industrial nation annually uses (directly or indirectly) about 208,000 kg (229 tons) of water, 660 kg (0.8 ton) of food, and 3,146 kg (3.5 tons) of fossil fuels and produces 1,660,000 kg (1,826 tons) of sewage, 660 kg (0.8 ton) of solid wastes, and 200 kg (440 lb) of air pollutants.

If these are exported without care, they pollute the countryside, reducing its ability to provide necessary resources for the city and making life in the surroundings less healthy and less pleasant.

The Importance of Site and Situation

The location of a city is influenced primarily by the site, which is the summation of all the environmental features of that location

The situation is the placement of the city with respect to other areas.

A good site includes a geologic substrate suitable for buildings; nearby supplies of drinkable water; nearby lands suitable for agriculture; and forests.

Sometimes, however, other factors—such as the importance of creating a port city—can compensate for a poor geological site, as long as people are able to build an artificial foundation for the city and maintain that foundation despite nature's attempts to overwhelm it.

Site Modification Site is provided by the environment, but technology and environmental change can alter a site for better or worse.

An Environmental History of Cities

The Rise of Towns

The first cities thousands of years ago, during the New Stone Age, with the development of agriculture, which provided enough food to sustain a city.

The impact of city on environment was low because they are small ad not crowded.

The Urban Center

In the second stage, more efficient transportation made possible the development of much larger urban centers. Boats, barges, canals, and wharves, as well as roads, horses, carriages, and carts, enabled cities to rise up and thrive farther from agricultural areas.

The Industrial Metropolis

The Industrial Revolution allowed greater modification of the environment than had been possible before. Three technological advances that had significant effects on the city environment were improved medicine and sanitation, which led to the control of many diseases, and improved transportation. Modern transportation makes a larger city possible.

The Center of Civilization : the beginning of a new stage in the development of cities.

With modern telecommunications, people can work at home or at distant locations and decrease the necessity for transportation, the city can become a cleaner, more pleasing center of civilization.

But still need for energy and material resources, which are certainly not guaranteed.

If energy resources are rapidly depleted, modern mass transit may fail, fewer people will be able to live in suburbs, and the cities will become more crowded.

Reliance on coal and wood will increase air pollution.

Continued destruction of the land within and near cities could compound transportation problems, making local production of food impossible. The future of our cities depends on our ability to plan and to use our resources wisely.

City Planning and the Environment

If people live in densely populated cities, ways must be found to make urban life healthy and pleasant and to keep the cities from polluting the very environment that their population depends on.

City planners have found many ways to make cities pleasing environments: developing parks and connecting cities to rivers and nearby mountains in environmentally and aesthetically pleasing ways.

City Planning for Defense and Beauty

City planning can be traced back as far as the 15th century.

Defense and beauty have been two dominant themes in formal city planning. We can think of these two types of cities as fortress cities and park cities.

The goal was to create a beautiful city with many parks, including small ones at the intersections of avenues and streets.

The City Park

Parks have become more and more important in cities.

Central Park in New York City, the first large public park in the United States. The park's designer, Frederick Law Olmsted, was one of the most important modern experts on city planning. He took site and situation into account and attempted to blend improvements to a site with the aesthetic qualities of the city.

Central Park is an example. In contrast to the approach of a preservationist, who might simply have strived to return the area to its natural, wild state, Olmsted created a naturalistic environment, keeping the rugged, rocky terrain but putting ponds where he thought they were desirable.

An extension of the park idea was the “garden city,” a term coined in 1902 by Ebenezer Howard. Howard believed that city and countryside should be planned together. A garden city was one that was surrounded by a greenbelt, a belt of parkways, parks, or farmland. The idea was to locate garden cities in a set connected by greenbelts, forming a system of countryside and urban landscapes.

The City as an Environment

The Energy Budget of a City

Like any ecological and environmental system, a city has an “energy budget.” The city exchanges energy with its environment in the following ways:

(1) absorption and reflection of solar energy,

(2) evaporation of water,

(3) conduction of air,

(4) winds (air convection),

(5) transport of fuels into the city and burning of fuels by people in the city, and

(6) convection of water (subsurface and surface stream flow).

These in turn affect the climate in the city, and the city may affect the climate in the nearby surroundings, a possible landscape effect.

The Urban Atmosphere and Climate

Cities affect the local climate.

Cities are generally **less windy** than nonurban areas because buildings and other structures obstruct the flow of air. But city buildings also channel the wind, **sometimes creating local wind tunnels** with high wind speeds.

A city also typically **receives less sunlight** than the countryside because of the particulates in the atmosphere over cities—often over ten times more particulates than in surrounding areas.

Despite reduced sunlight, a city is a heat island, **warmer than surrounding areas**, for two reasons:

- (1) the burning of fossil fuels and other industrial and residential activities and
- (2) a lower rate of heat loss, partly because buildings and paving materials act as solar collectors

Solar Energy in Cities

Until modern times, it was common to use solar energy, through what is called today passive solar energy, to help heat city houses. Cities in ancient Greece, Rome, and China were designed so that houses and patios faced south and passive solar energy applications were accessible to each household. The 20th century in America and Europe was a major exception to this approach because cheap and easily accessible fossil fuels led people to forget certain fundamental lessons. Today, the industrialized nations are beginning to appreciate the importance of solar energy once again. Solar photovoltaic devices that convert sunlight to electricity are becoming a common sight in many cities

Water in the Urban Environment

Modern cities affect the water cycle, in turn affecting soils and consequently plants and animals in the city.

Streets and buildings prevent water infiltration, most rain runs off into storm sewers.

The streets and sidewalks also add to the heat island effect by preventing water in the soil from evaporating to the atmosphere, a process that cools natural ecosystems.

Chances of flooding increase both within the city and downstream outside the city.

Most cities have a single underground sewage system. During times of no rain or light rain, this system handles only sewage. But during periods of heavy rain, the runoff is mixed with the sewage and can exceed the capacity of sewage-treatment plants, causing sewage to be released downstream without sufficient treatment.

Because of reduced evaporation, midlatitude cities generally have lower relative humidity than the surrounding countryside.

Cities can have higher rainfall than their surroundings because dust above a city provides particles for condensation of water vapor.

Fog is particularly troublesome in the winter and may impede ground and air traffic.

Soils in the City

Most of a city's soil is covered by cement, asphalt, or stone, the soil no longer has its natural cover of vegetation, and the natural exchange of gases between the soil and air is greatly reduced.

Soils lose organic matter, and soil organisms die from lack of food and oxygen.

The construction process and the weight of the buildings compact the soil, which restricts water flow.

Pollution in the City

- City dwellers are exposed to more kinds of toxic chemicals in higher concentrations and to more human-produced noise, heat, and particulates than are their rural neighbors.

- Some urban pollution comes from motor vehicles, which emit nitrogen oxides, ozone, carbon monoxide, and other air pollutants from exhaust.

- Electric power plants also produce air pollutants.

- Home heating is a third source, contributing particulates, sulfur oxides, nitrogen oxides, and other toxic gases.

- Industries are a fourth source, contributing a wide variety of chemicals. The primary sources of particulate air pollution—which consists of smoke, soot, and tiny particles formed from emissions of sulfur dioxide and volatile organic compounds—are older, coal-burning power plants, industrial boilers, and gas- and diesel-powered vehicles. It is possible to reduce exposure through careful design, planning, and development.

Urban “Wilds”: The City as Habitat for Wildlife and Endangered Species

We can divide city wildlife into the following categories:

(1) species that cannot persist in an urban environment and disappear;

(2) those that tolerate an urban environment but do better elsewhere;

(3) those that have adapted to urban environments, are abundant there, and are either neutral or beneficial to human beings; and

(4) those that are so successful they become pests.

Cities also have natural habitats in parks and preserves. In fact, modern parks provide some of the world's best wildlife habitats.

Cities that are seaports often have many species of marine wildlife at their doorsteps.

Rivers and their riparian zones, ocean shorelines, and wooded parks can provide habitats for endangered species and ecosystems. Urban drainage structures can also be designed as wildlife habitats.

Animal Pests

Pests are familiar to urban dwellers. The most common city pests are cockroaches, fleas, termites, rats, pigeons, and (since banning DDT) bedbugs, but there are many more, especially species of insects.

In gardens and parks, pests include insects, birds, and mammals that feed on fruit and vegetables and destroy foliage of shade trees and plants. An animal is a pest to people when it is in an undesired place at an undesirable time doing an unwanted thing.

Animals that do well enough in cities to become pests have certain characteristics in common. They are generalists in their food choice, so they can eat what we eat (including the leftovers we throw in the trash), and they have a high reproductive rate and a short average lifetime.

Controlling Pests

We can best control pests by recognizing how they fit their natural ecosystem and identifying the things that control them in nature. People often assume that the only way to control animal pests is with poisons, but there are limitations to this approach. Early poisons used in pest control were generally also toxic to people and pets. Another problem is that reliance on one toxic compound can cause a species to develop a resistance to it, which can lead to rebound—a renewed increase in that pest's population. A pesticide used once and spread widely will greatly reduce the population of the pest. However, when the pesticide loses its effectiveness, the pest population can increase rapidly as long as habitat is suitable and food plentiful.

The Ecological Footprint

Ecological footprints measure the extent to which humans are using the Earth's bioproductive capacity.

Is a measure of the load imposed by a given population on nature.

Represents the land area required to sustain a given level of resource consumption and waste discharge by that population

The land area required to provide the energy and material requirements by the economy (measured in ha)

Measuring

The land required to sustain a particular human population - that is the area of land of various classes that is required on a continued basis to:

- Provide all the energy and material resources consumed
- Absorb all the wastes that assimilate

With respect to sustainability of the human endeavor, population growth rate and population size are only part of the picture: per capita consumption is the other

Developed countries have very large ecological footprints.