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Cities are the rich nodes of **civilization**, the centers of every nation's culture, its commerce, arts, and sciences, which explains why so much attention is focused on their forms, their structures, and their internal functions. Much less attention has been paid to outer ties, relating the city ecologically to its larger geographic setting: the primary focus of this article.

Like coral reefs, **cities are complex ecosystems: three-dimensional physical bodies, a close fusion of organic and inorganic components** . Analogous to individual organisms, each volumetric city ecosystem depends not only on internal exchanges but also on outside exchanges, relying on the latter for the provision of necessary energy/materials and for the disposal of unnecessary wastes. The far-reaching effects of energy/material inputs and outputs constitute the ecology of these peculiar human-dominated ecosystems.

Confusion results when the inner functionings of cities, their physiology, is mislabelled their ecology. An example is the book, "**The Ecological City**" a collection of essays that largely deals with internal improvements of urban settlements by designing into them more of the

undomesticated world.1 True, an inner ecology does exist in every urban setting, but it is not the ecology of the city; it is the ecology of people, the connections between inhabitants and the city ecosystem that envelops them.

At the ecology-of-cities level, within Earth's regions, problems are much less tractable than at the ecology-of-people level, within cities. Uncritically mixing the two dissimilar levels fosters an unwarranted optimism about solving city problems. Babylon and Tikal are reminders that city planning and city beautification are no hedge against the dangers of peripheral influences, especially those rendered virulent by neglect.

Civilization = Cities

Cities sprouted from the seeds of agriculture. The tending of crops imposed a sedentary lifestyle, a staying in place to protect the growing food plants and to reap the harvest. The greatest change in human culture after the taming of fire around 200,000 BCE began a mere ten millennia ago when nomadic foragers, enlightened in the art of gardening by women, settled down and turned inventive. Using such technologies as hoes, wheels, and irrigation in fertile valleys they were soon producing surpluses of storable and transportable food. Invigorated by trade and by centralized religious ceremonies, agriculture-based hamlets grew into towns and then into cities. Civilization flourished. Strongmen, priests and kings, took charge. The rest, as they say, is history--of a certain biased kind.

The story of civilization is the story of cities, as shown by the etymology of the two related words. To civilize means to citify, to step out of a primitive or savage condition into a higher existence. To live in the city is to come up in the world, to be cultured and mannerly rather than rude and barbaric, presumably a step closer to Heaven: the "City of God" according to the psalmist (Psalm 46:4).

History slights unlettered rubes and heathens out in the heather. They write no stories and their oral narratives are ephemeral. Histories are the records of civil citizens living in cities, the latter term derived from the Indo-European base "kei" meaning "to camp." Home is the city. "Every Golden Age is an Urban Age," wrote Sir Peter Hall.(2)

City historians recount the wavelike rise and fall of city civilizations. Between the crests, in the fallen state, reports on the conditions of life are few and uniformly bad. With the glitter of cities gone, Hobbesian times are assumed to prevail; life is nasty, brutish, violent, and short. No news is bad news until, favored by ameliorating climate, new technology, discovery of unexploited lands, or expropriations through warfare, another round of civilization begins. Revivified through favorable ecological connections, new cities appear and scribes resume the chronicle of important human enterprises.

Cities Non-Self-Sustainable

Scrutiny of the rise and fall of civilizations from an ecological perspective reverses the picture. The up-city/down-city phases of civilization's cycle come into focus as "the unsustainable city phase" and "the sustainable non-city phase." The "rise" of civilization, when cities grow, is a transient stage of exploitive living. The "fall" of civilization, when cities collapse, marks return to sustainable living on the land.

In the past, cities fell apart when they had exhausted their hinterlands or invaders had done so. Then the population, much reduced in numbers, reverted to foraging and simple subsistence agriculture: the only dependable, time-tested way of living that always works.(3) During the so-called "Dark Ages" the treasures of western culture survived in monasteries: forms of rural, horticultural, communal, subsistence living that are models of sustainability and, except for their sexual aberrance, patterns of high culture.

Today cities thrive world-wide, borne to new heights on gushers of oil that make them potential hostages of a few feudal families in the Middle East. Hegemonous Western civilization is on a roll, setting the trend of rural depopulation and urbanization for all the world to follow. Fifty percent of Earth's six billion people now live in cities and the numbers keep rising. Apart from tangles of vehicles that poison the air, and wretched living conditions for the poor, no insurmountable problems have so far appeared. Cheap transportation based on cheap hydrocarbons has enlarged the hinterlands of cities to include the entire planetary surface. Global trade is ascendant and all necessities, plus a plethora of manufactured instruments of comfort and delight, can be drawn from any part of the globe.

Cities continue to expand and to increase in number while non-human nature degenerates and shrinks. An unhealthy world seems to be the price of a "healthy" (ever-growing) economy whose focal points, according to Jacobs, are vigorous cities rather than the nations that comprise them.(4) All developing economic life depends on city economies because, wherever economic life is growing, the process creates cities. Her nightmare, she has said, is city stagnation globally: no vigorous mature cities, no young cities arising. In such a sad scenario,

all is lost; humanity is on the dreary road to Universal Ethiopia. Take your pick: either volatile, growing, trading cities, or the back-breaking, backwoods poverty of the primitive foraging society.

There must be other choices. Forty years after "Silent Spring" and the dawning of the Age of Ecology, all glowing commendations of cities as engines of economic growth seem slightly perverse. The thesis that cities are the source of wealth is correct only in the sense that today's human wealth is nature's wealth made over by urban know-how. But a world of growing cities, each building up its industrial plant to reduce dependency on imports so as to become itself a competitive exporter, is a recipe for global disaster. Only the naive can be optimistic and confident that city wealth and city technology will solve the environmental problems they create out of sight beyond their borders.

Historically, the supple Neolithic stage between the two male worlds of Hunter and Urban Broker was a viable way of living. Today's city fathers (city mothers being notably absent) would do well to explore modern variations of the old sustainable nurturing option again.

Global Influence of Cities

Six hundred years ago, cities were islands in a patchwork of farms and wilderness. Today they dominate the world and their influence is felt everywhere. Thanks to them the lower atmosphere is a smog soup, soils and food are chemicalized, and millions drink bottled water daily. The human species, adaptable and compliant, accepts all this as unexceptional, as the way of the world. If asked to comment on cities and the lifestyles they entrain, most would undoubtedly simply say: "That's Progress." Big cities are the norm today and their central status is unquestioned.

Jerry Mander castigated the media for not ferreting out the relationships, the critical connections, between Earth's environmental problems, current economic theories, and the ways people choose to live.(5) Superficially unrelated happenings--such as clogged highways and climatic change, deforestation and loss of biodiversity, marine technology and collapse of cod and salmon stocks--spring from the same common root: faulty ideas about material progress and about the possibility of ever-higher standards of living for a burgeoning world population. Reigning theories assume the excellence of economic growth and foster its tools of science and technology. They encourage the accelerating use of irreplaceable fossil fuels and Earth's other natural assets. They promote greater global trade and transport, cheering on the adoption of lifestyles that are commodity-intensive. City leadership, exemplified by city growth, is an integral part of this transient splurge.

The decisions, the planning, the lifestyles in cities determine what happens to the nation and to Earth. Therefore, the chief "city problem" is ecological, concerning the impacts of cities on the world outside them. Yet these ecological relationships get secondary attention in urban studies. Most of the latter are physiological, focused on inner functioning, on problems of living within the boundaries. Such analyses are the source of articles on "the Eco-City," "the Livable City," "the Green City." They search for ways to make life bearable in the midst of noise, crowds, flashing lights, traffic, smog, asphalt, stone and glass. The focus on cosmetic rearrangements within cities avoids confronting the mayhem that cities inflict on the regions around them and, by summation, on the Earth.

What needs examination is not urban renewal, affordable housing, architectural creativity, green park spaces, car-free malls, bicycle paths, safe lighting, or even the larger social injustice issues that work against these narrow though commendable objectives. The big question concerns the implications of increasing urbanization for the future of the countryside, for global soils and air, for natural areas and wilderness preserves, for lakes and free-running rivers, for forested landscapes patch-skinned at an accelerating rate, for the 30 million other species of organisms to which we are companions. In short, what is the relationship of cities to their hinterlands and, in times of dirt-cheap fossil fuel that allows irresponsible global trade, to the whole Earth?

Cities and their Hinterlands

Lewis Mumford was one of the first to ask ecological questions about cities and their sustainability. His 1965 article, "***The Natural History of Urbanization***," is precisely on the ecology of urbanization.(6) He noted the dependencies of cities on their hinterlands, and the steady extension of their influences aided by the growing power of transportation technology. He pointed out that the city story, from Nineveh to New York, is one of increasingly substituting the artificial for the natural. Technology rearranges environments so that nature is never experienced directly. In losing connections with Earth within the city, inhabitants also lose track of Earth-relationships without. An illusion of complete independence from nature is fostered, and the phrase "urban sustainability" is no longer recognized as oxymoronic. Mumford expressed pessimism about modern large cities because of their dependence on plunder of the non-urban hinterland.

The same dark thread runs through his "***City in History: Its Origins, its Transformations, and its Prospects***," published five years later when cities of the world were under threat of nuclear annihilation.(7) But although Mumford's reading of history repeatedly revealed Metropolis ending in Necropolis, the City of the Dead, he was optimistic that it need not be so. His book is one long sermon exhorting humanity to be better and to do better, not by renouncing the city as a structural/functional error but by converting it,

somehow, into what it is not: an environment for fostering community and advancement to a higher-than-economic life, an environment for "man devoting himself to the development of his own deepest humanity," a true vehicle of human progress. This recurring theme expresses his frustrated longing for the city as container-museum of mankind's superlative achievements.

The stage for the city was set, according to Mumford, by the first progressive step from man-the-hunter and his clan to the village-based matrifocal agricultural society. The change from wandering forager to sedentary farmer marked "a sexual revolution, a change that gave prominence not to the hunting male but to the more passive female; home and mother are written over every phase of neolithic agriculture." The next quick step upward was from female village to dominance by the male city.

Mumford's thoughts on the city are ambivalent. He is convinced it is the highest and best structure within which men, drawn by "social and religious impulses," come together "for a more valuable and meaningful kind of life." At the same time he identifies the city as a center of power, aggression, and aggrandizement, contemptuous of organic processes, contributing to violence and war, eventually inviting its own destruction. Post-city, the people return to rural living-on-the-land in small communities. Then, in the repeating cycle, Mother-Village nurtures another crop of competitive City-Sons.

Each fresh Metropolis is reconstituted both physically and ethically by drawing on "the positive forces of cooperation and sentimental communion kept alive in the Village." New life, fresh and unsophisticated, "full of crude muscular strength, sexual vitality, procreative zeal, and animal faith" is recruited from rural regions to build new cities or rebuild the old. In Jeffersonian tones Mumford warned that the ancient factor of safety for cities will vanish with the disappearance of the rural source of strength. He accepted the latter as essential for provisioning the city, but not as itself an acceptable environment. To him the rural source is passively female, described as an "unfertilized ovum" needing male insemination to become the urban "developing embryo."

Mumford's writing is riddled with patriarchal assumptions. His protests to the contrary, the feeling is conveyed that the aggressive pursuit of wealth and status in canyons of steel is far more valuable than the softer callings of gardening and domestic muddle in the Village. From a feminist perspective (if that privilege is allowed me) city culture is a slide back to man-the-hunter, rather than a step up from the matrifocal agricultural society. Significantly, girls like horses while boys prefer motorcycles. Mumford is one of the boys, riding the city-machine.

Cities and the Good Life

What is the city? Originally, and still in Mumford's words, "an instrument for regimenting men, for mastering nature, and for directing the community to the service of the gods," which today are commerce, economic growth, and global free trade. City gods, projections of male fantasies, have always been hegemonous, wrathful, jealous of other gods, and especially resentful of goddesses. Men make themselves in the images of their gods, and they suffer for it.

Sennett was convinced that suffering is the essential city experience.(8) He viewed cities as both techniques of power and places of redemption through pain: convents for married people. Commanded to live together as exiles from Eden, people share unhappiness and distress in the city. There the sad experiences of the body, reflected in ugly urban architecture, hone human sensitivity. The worse things get in cities, the more hope for fashioning a caring society. Looking at the shambles of Greenich Village, once a model of community, Sennett is close to despair. His "Oh Grave, where is thy Victory?" theme, a courageous attempt to find shadows of hope in depresssing urban realities, is far distant from the optimism of city-eulogists who, unlike Sennett, have not faced up to night gunfire, crack houses, and HIV.

When celebrants sing praises of cities as places that magnify and enrich human potentiality, that encourage the fullest expression of human capacities and potentialities, that develop the depths of humanity, that store and pass on progressive human culture, one hears an echo of platitudinous, self-congratulatory convocation addresses in praise of the University, itself a city institution. Having convinced themselves of the glories of life in cities compared to the idiocy of rural life, the urbane are blind to the competitive, individualistic dominance theme that works against community. They prefer the hard-boiled eggs of the city to the "unfertilized ova" of the Village, and foresee no future other than an urban future.

To the urban intelligentsia, the flaws of the city are surface blemishes that can be patched or glossed over. Assured that the city is the best machine for living, they trust that this time around it will never stop, that Necropolis is forever banished. Sir Peter Hall, the latest city exalter, expresses unbounded confidence:

"No one kind of city, nor any one size of city, has a monopoly on creativity or the good life; but ... the biggest and most cosmopolitan cities, for all their evident disadvantages and obvious problems, have throughout history been the places that ignited the sacred flame of the human intelligence and the human imagination. Spengler was wrong, for after the sunset comes the dawn; unlike Spengler (and unlike Mumford) this is no tale of decline or disintegration. At the end of the 20th century--80 years after Spengler foretold the decline of the West, 60 years after

Mumford saw the modern city proceeding inexorably to Necropolis--neither western civilization nor the western city shows any sign of decay. On the contrary, this book will be a celebration of the continued vitality, the continual rebirth of creativity in the world's great cities, as the light wanes in one, it waxes in another; the whole process, it seems, has no end that we know of, or can foresee. The central question, now, is precisely how and why city life renews itself; exactly what is the nature of the creative spark that rekindles the urban fires."(2)

Hall examines neither city ecology nor the dependability of the sumptuous supply of oil and gas that currently stokes the urban fires as it has done since Spengler's time. He writes as one of C.P. Snow's literary intellectuals who hold that culture is autonomous, needing for its ignition no sacred flame nor creative spark from the real world.(9) He puts down Mumford as "fundamentally a brilliant polemical journalist, not a scholar."

I defend the journalist against the scholar. Mumford did acknowledge, at least from time to time, the dependence of the city on what lies outside it. In contrast, the scholar's weighty book--1168 pages with no index entries on ecology, environment, fossil fuels, or energy--assumes no limits to growth and vast possibilities for new Golden Ages of production and consumption, with technology leading the way. Unconnected to Earth, the book is vivid proof that the proper habitat of the city-shaped intellect is fantasyland, aka virtual-reality.

Cities and Virtual Reality

Consideration of the ecology of cities--their relationships to their regions and to Earth--reveals a precarious dependence of which the inhabitants are unaware. Cocooned away from the real world, city folk live in ignorance of their life-support system.

The "culture" for which cities are acclaimed is itself a kind of virtual reality, providing various compensations for separation from the natural world. Artifice is used to plug the holes in urban lives with facsimiles of important experiences thoughtlessly blown away. The arts serve as humanistic buoys to keep spirits afloat after natural life-preservers have been discarded. Jean-Jaques Rousseau's sour comment that "big cities need plays and corrupt people need novels" can be more positively phrased: "Artists provide food of variable quality for starving souls in cities."

Were Rousseau with us today he would note that, in addition to plays and novels, city people also need the movies, sports arenas, churches, galleries, theatres, zoos, museums and exhibition halls for the display of natural, historical and scientific objects.

In various ways these cultural institutions provide laundered glimpses of the real world of stars, of living landscapes, and organic things. They also offer sanctuaries, escape into quietness or at least, in the concert hall, harmonic relief from simian chattering and city noise. Visit the gothic cathedral to experience the virtual reality of the forest grove and of rolling thunder from the pipe organ. See in the zoo the world's animal inhabitants, and in the planetarium the night sky. Look at the stuffed birds in the museum and watch the nature programs on TV. Drive to the gymnasium and exercise those little-used leg muscles on a treadmill. Immerse yourself in the Olympic-size swimming pool and breathe its chlorinated effluvium, a high-tech substitute for the lake and its bracing air. Study the man-made architecture of old buildings and neglect the marvellous architecture of the world. In short, trust human ingenuity to invent substitutes for nature where it has effectively been walled out. When that falls short of expectation, try Prozak or meditation: therapy for the urbane.

The Ecological Footprint of Cities

In cities the massive import of materials providing food, clothing, shelter, energy and industrial needs, mostly drawn from outside the metropolitan boundaries, is taken for granted. This basic dependency on the wider world is seldom discussed. Veiled also is the equivalent outflow of waste materials and heat that the hapless hinterland must absorb in exchange for its gifts.

A University of British Columbia task force on healthy and sustainable communities developed an ecological accounting tool: the land area needed by average citizens both to provide their resources and to assimilate their wastes at current standards of living.(10) The total "ecological footprint" of each Canadian works out to about 4.2 hectares(10.4 acres). The ecologist Eugene Odum made a similar calculation for Georgia, a State considered to be sparsely populated.(11) There, in a better climate, the "ecological footprint" of each inhabitant is less than in Canada: about 2 hectares (5 acres). Dividing this into the total area of the State showed it pressing close to overpopulation. Extrapolating studies such as these to the year 2050, several more planet Earths will be required to provide a North American standard of living for the expected 10 billion people!

The impossibility of maintaining today's consumer society in the world of the future suggests curbing the industrial activities of cities and their profligate use of nature's wealth. Economists deem the idea absurd. The market, tuned to inventory, reports abundance; it does not signal unsustainable depletion rates. Further, science and technology will surely come to the rescue should crises loom. Therefore such books as "***Reinventing Cities for People and the*** Planet," imply that cities will carry on indefinitely as before, made greener by improved management of water, waste, food, landuse, transportation, and energy.(12) The last-named is the keystone that supports all the others. Will the energy supply energize cities forever?

Energetics of City Ecosystems

The city ecosystem is a sub-system of Earth that operates according to the same rules as a tract of tropical rain forest or a farm. All run on energy, the true currency of the universe.

A small part of the usable energy at Earth's surface comes from its radioactive interior as geothermal energy, but most is provided by the sun in two forms: diffuse daily radiation that seasonally causes trees, grasses, and algae to grow, and the concentrated fossil sunlight stored in plants and animals dead-and-buried long ago, dug out from underground in the form of hydrocarbons that allow cities to function and grow. Industrial civilization is fired up on fossil fuels.

Leaders of governments and their economist advisers are seldom versed in the Second Law of Thermodynamics and its axiom that energy cannot be recycled. With each transformation in use, energy is irretrievably lost until, dissipated as heat, it is radiated off into space. Direct solar radiation is renewed every day when the sun rises, but the stored solar radiation in fossil fuels is non-renewable; once used it is gone forever.

As the rich, easy-to-mine hydrocarbons are marketed and burned away, currently at the rate of 70 million barrels a day, more and more energy must be expended to find and develop the poorer, more difficult-to-reach sources.(13) Sometime in the 21st century the energy required to extract hydrocarbons from Earth will equal or exceed the energy content of what is recovered. Then the net energy--the energy remaining after the energetic costs of drilling, pumping, mining, refining, and transporting have been paid--will be zero. No substitute stands ready to take the place of the power-packed hydrocarbons. The best prospect, nuclear energy, is proving environmentally disastrous. Therefore, economists and their faith in substitutability to the contrary, all human institutions dependent on fossil fuels will literally "run out of gas" and collapse--if pollution or some other catastrophe has not forced the issue earlier. This most realistic of the "doom models" is the least discussed.(14)

The timing of the demise of the world's cities, from Metropolis to Necropolis, hinges on the rate of depletion of fossil sunlight: the non-renewable hydrocarbons. As supply declines, the smaller cities will be best positioned to survive by decentralizing into sustainable nodes (back to the agricultural Village plan, the small Garden City). Such a happy ending assumes that, with foresight, the last inventory of non-renewable energy will have been used to establish renewable energy systems: geothermal, hydroelectic, wind, biomass, and direct sunlight. It ought to be happening now.

Cities and Culture

Are cities necessary for healthy psychological and social living? It seems unlikely, given humanity's long ex-urban evolutionary history. The opposite thesis, that cities breed various kinds of unhealthiness, is much more likely.

According to Theodore Roszak, city dwellers are psychotic victims of EDD: Earth Deficiency Disease. His diagnosis emphasizes, in another way, that the ecological environment outside the city is more important than the social environment within. Healthy childhood requires opportunities for outside-the-city nature experiences, especially those revealing Earth in its life-giving, food-giving, care-giving role. Roszak remarked that the way the world (the city-as-environment) currently shapes the minds of its children, especially the boys, lies somewhere close to the roots of humanity's environmental dilemma.(15)

As to the social environment, large cities are generally deemed to be the centers of originality and creativity, feeding the flame of culture. Sponsored by city wealth, cultural pursuits are drawn into the urban machine which is then confirmed as their natural home. Much of what is popularly considered culture in the creative arts and sciences is disconnected from reality by the very fact that the city is its milieu. City culture is refined in a virtual-reality crucible, a container insulated from its roots, out of touch with its source. Such a culture is likely to be blind to Nature's truths, unintentionally contributing to and supporting urban fantasies of which there are many.

The intellectual religions of the world are the mind's supreme virtual realities. City-based and patriarchal, they renounce Animism with its vital insight that Mother Earth is the life-source. Technology is the body's supreme virtual reality. City-based, it renounces Nature and substitutes artifice for the essential processes of Earth. Virtual MindBody is perfectly realized in the city and with it Virtual Culture that has little connection with Earth.

Conclusion

Suppose that the end of cities as we know them can be foreseen as the time--20, 30 or 40 years from now--when the flow of irreplaceable, non-renewable resources that support civilization slows to a trickle. To survive and thrive, humanity will have to live a different kind of life based on different values and different attitudes. City culture, the culture of civilization, will be passe--not because it served humanity badly but because on a depleted, impoverished planet it is irrelevant. City culture will be a museum piece remembered for its wanton ways, displayed in another kind of Earth environment.

In tracing the history of deforestation for city-building through the ages, Perlin commented that "***civilization has never recognized limits to its needs***."(16) Nothing today contradicts that statement. Its truth means that cities and city culture cannot be beacons for the future. The source of a sustained human culture will always lie outside the city, in closer ecological relationships to Earth.

The 20th Century neglected the ecology of cities, assuming that they will go on forever. The imagining, designing, and testing of sustainable alternatives to cities and city culture by the arts and sciences is the task of the dawning 21st.

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