

Letter From the Desk of David Challinor
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Our country's surface has been greatly altered over the last century and this change is well-documented. Thanks to a photographic record accumulated after the turn of the century, we have a graphic dossier of the manner and rate at which our landscape is changing. Similar data is being recorded elsewhere around the globe, so that today we can extrapolate a reasonable expectation of what the world's land surface will look like 100 years hence. Predictions are risky and necessarily based on past trends, but they are also challenging, intellectually interesting and may entertain our successors when they consider how wrong or right we were. This letter describes some of the methods used to predict landscape change.

In the last century the greatest engine for land surface alteration was an exploding human population with the technical capacity to modify the land on a massive scale. Previously, such alterations were scattered and of a scale seldom visible from space. Today, humans are concentrated in temperate or subtropical life zones making it unlikely that the Antarctic, Australian outback or Sahara will ever be crowded with people. The greatest physical changes will probably occur in areas where humans are most concentrated, as we learned from the satellite imagery which blossomed during the great era of space exploration in the 1960's. Fueled by Cold War military photographic equipment, resolution, coverage and clarity of image rapidly improved; today almost every surface area of the Earth is being continually monitored.

Space images of our planet have confirmed what every observant adult has seen during his or her lifetime. As cities expand, the surrounding undeveloped land is converted in ever widening circles into housing lots and shopping centers to serve the new inhabitants. This phenomenon is particularly apparent in the United States where suburban housing is fueled by prosperity and a well-established government policy of subsidizing home ownership through tax incentives. In Europe, new housing is more rigidly controlled because there is less undeveloped land and a longer tradition of strict zoning. Also, local public access to forests, heaths and beaches has long been guaranteed. In the developing world, at least until very recently, the expense of individual car ownership, a limited number of highways and aged railroads all make long distance commuting for most workers practically impossible. Thus immigrants have little choice but to squeeze into existing crowded urban districts to insure access to work.

One cannot really compare development of Third World cities with those of prosperous nations. The former, for example, are already bypassing some of the traditional technologies. Bangkok and Cairo will probably never develop the extensive hard-wire phone system so common in North America and Europe. Instead, they seem to be moving directly to cell phones, thereby avoiding the enormous investment in laying more phone lines either above or below ground. These cities are also unlikely to build subways because the construction would disrupt

their existing fragile, overextended, surface transportation system. However, they will certainly have to build more high rise apartments to house the expected swarm of immigrants who will have to live near their jobs due to a lack of good intra-city transportation.

All cities will inevitably expand geographically, although some will be constrained by their location. Mumbai (Bombay), for example, has the ocean on its west and the Western Ghats (mountains) to its east. The city has thus spread north until it now occupies a 20 to 25 mile coastal strip. Traffic on the main north-south thoroughfare is already far over its limit, and the city fathers may now have to look at some imaginative along-shore transportation system to link the narrow city. In the process, a whole new sanitary and storm sewer system will have to be built so that the adjacent beautiful beaches can be used again for bathing.

City expansion along the United States' east coast differs from that of Mumbai in that cheap gasoline, easy accessibility to individual cars, and heavily subsidized roads and highways have all encouraged long distance commuting. Prescient individuals, such as Dillon Ripley, the seventh Secretary of the Smithsonian, recognized as early as 1964 that Washington and Baltimore would eventually merge. With this thought in mind, he persuaded the Regents not to sell Java Farm when this abandoned 350-acre tract was unexpectedly willed to the Institution. Initially the Regents had planned to sell the farm and add the proceeds to the Institution's then minuscule endowment. Instead, using the farm as a nucleus, the Smithsonian gradually assembled over 3,000 contiguous acres through purchase, gift and restrictive covenants. The Smithsonian Environmental Research Center (SERC), as it is now known, encompasses the lower third of the 10,000-acre Muddy Creek watershed. Ripley's foresight 26 years ago has materialized and today the originally rural surroundings have been transformed into endless housing subdivisions in one of the fastest growing counties in metropolitan Washington. Even as housing expands around SERC, there will still be a green 3,000-acre oasis for future generations to protect.

The Chesapeake's western watershed has been closely monitored by satellite from 1973 to 1997, and the American Forests Association analyzed the imagery to determine forest cover. They found that within the 11.4 million acres in the Washington/Annapolis/Baltimore triangle, tree cover declined from 51% of the land area to 37%. Further analysis showed that areas with little or no tree cover, such as buildings or shopping mall parking lots, increased by 18% during this time. These statistics are no surprise to those of us who live in the area and see this change with our own eyes. This trend towards deforestation appears to be indefinite, but clearly it cannot continue forever. The next question is: What limiting factors are at work?

People will always have to eat and that means that adequate land will continually have to be set aside to grow crops. Currently agriculture occupies about 38% of the world's land surface, and this percentage seems unlikely to change significantly because virtually all the world's cropland is already being used. To feed the expected increased population will require an equivalent increase in productivity on existing farmland. This goal should be attainable despite problems in certain parts of the globe. Sub-Saharan Africa has frequently experienced

severe droughts, and it will be a challenge to increase crop production there by 2 to 3% by 2050 to feed a human population which is expected to double by then. An encouraging sign is that the annual average increase in crop production for this area has grown by 2.4% for the last five years.

Agricultural output has boomed in the United States, and we are now having to consider some of the hidden costs of this bonanza. My recent letters have raised the issue of destructive nitrogen runoff in the Mississippi drainage basin, but control of this and other excessive fertilizer and insecticide use is feasible without reducing yield. One possible solution is to increase the planting of genetically modified crops, but this practice has problems of its own, both scientific and emotional. My prediction is that the risk of pesticide use will eventually be weighed and that genetically modified crops will be accepted for human consumption. Hybrid corn, for example, is a form of a genetically controlled crop which has been and still is in widespread use.

A more insidious problem for maintaining adequate agricultural yield in the United States is the creeping encroachment of housing developments on fertile agricultural land. This phenomenon is particularly striking in California, whose prosperous population can afford a large house on several acres of former cropland. The huge Levitt-towns built on the Long Island potato fields after World War II were highly visible and densely concentrated in contrast to the increasing trend toward "gated communities" with fewer houses per unit surface. At some point in this century, productive agricultural land will compete directly with housing sites. Meanwhile, people continue to build on heretofore inaccessible sites such as the California coastal cliffs, New England forests, and Montana prairies. In rural Vermont, land is being developed at two and a half times the rate of population growth. Similar trends are occurring at slightly lower rates in Maine and New Hampshire. Such development activity has reversed the trend that began in the mid-19th century when farmers abandoned their rocky fields for the more fertile Midwest.

With the pendulum swinging back, my grandchildren may not get to see the treeless, hilly, sheep pastures that dominated the New England landscape 150 years ago, but rather scattered housing that will be shielded by foliage in summer, yet starkly visible in winter. This trend will increase, I believe, as computers enable more people to work out of their homes; but this land development cannot continue indefinitely. When all buildable housing lots are occupied, the challenge will be to see if our culture is flexible enough for all classes to live year-round in multifamily dwellings. The American dream of every family having its own separate house on a half acre lot is unsustainable.

What, then, can we expect to happen in the rest of this century? The cities in North America, Europe, Japan and some of the prosperous Southeast Asian nations will continue to sprawl in whatever direction geography allows. In the Third World, urban populations will continue to grow, but physical expansion will be limited by the lack of cheap, efficient, intracity transportation. Wherever there is more housing, there is less absorbing surface, which in turn

increases the risk of floods. Then more flood control projects are created to eliminate the water from the land which in turn creates a greater sediment load. The cycle continues.

If we can reasonably predict some of the consequences of an increasingly crowded planet, then it seems logical that we should begin now the transition to a new lifestyle. Creating expanding communities with multifamily housing is one important step. Whatever disadvantages might be perceived from this type of housing could be offset by well-designed open spaces and amenities for outdoor activities. Cars will certainly have to be smaller and less polluting, and the first tentative steps have already been taken to achieve this goal. We should also be prepared for increased limits on what we have long considered a traditional freedom -- to live wherever we choose and do whatever we want on public open land.

The trends to ameliorate the consequences of an overcrowded planet have already begun and are inevitable if humans are to maintain some kind of order in a crowded world. Stricter zoning regulations, wetland development constraints, and increasing opposition to new highways are all examples of the direction in which we are moving. Life will certainly be different, but there will be ample opportunity for individuals to enjoy their lifestyle. The prospect of an ever-broadening base to our knowledge of the world makes me envious of what my grandchildren will see. As an inveterate optimist, I anticipate a more interesting future world despite all the problems which we humans will undoubtedly continue to encounter.

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