

Signs of Climate Change Beneath Our Feet

by Glenn Rogers



The streets, sidewalks and roofs of cities all absorb heat during the day, making some urban areas up to six degrees Fahrenheit hotter than rural ones during the day—and 22 degrees F hotter at night —*Scientific American*

The Ground In Cities Is Getting Hotter

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In Chicago, a [recent study](#) measured the ground's warmth related to atmospheric temperatures. A scientist, Rotta Loria, collected data from 150 sensors in basements, underground parking lots, and train tunnels for three years. From this research, he concluded that, unlike the temperature in the atmosphere, ground temperatures could become increasingly warmer over time. The temperature rise was measured to be 0.25 degrees higher every year, and the accumulative effect of that temperature rise caused the ground

in cities to be 27 degrees F warmer than ground in undisturbed areas, e.g., parks or the countryside.

It's enough movement to cause buildings to tilt or cause water damage to foundations."

That is an example of the [urban "heat islands"](#) effect. Heat islands cause urban zones to grow hotter than rural zones during the day and as much as 22 degrees hotter at night. These temperature changes can make the soil expand and contract, causing stress to the concrete from the soil's movement. This movement is especially true of buildings beside water. San Francisco, close to the Bay, might be similarly affected.



Colors show underground temperatures in Chicago's Loop district. Alessandro F. Rotta Loria (temperature data); OpenStreetMap

DAMAGE CAUSED BY GROUND WARMING

By the year 2050, the accumulative warm ground temperatures of the soil may cause the ground to heave up to 0.5 an inch or shrink 0.32 inch,

depending on the characteristics of the soil. It's enough movement to cause buildings to tilt or cause water damage to foundations. Temperature change [affects](#) clay soils more than other soils. "Some parts of San Francisco, particularly in low-lying areas, exhibit clay-rich soils." However, in locations like the Marina district, for example, the original clay soil was modified with additional fill to provide a setting for the Panama-Pacific International Exposition of 1915.

A HIDDEN SILVER LINING

Fortunately, on a brighter note, the warm earth may be useful to heat buildings. For example, water pipes could be placed near hotspots to capture heat and the warm water could be circulated in buildings or public spaces. The cost would be expensive initially but could dissipate the ground warmth into the atmosphere, reducing the damage to buildings. That's one of the unexpected consequences of *Climate Change* that has not been publicized. Fortunately, now that this problem has been discovered, we can design for it.

Glenn Rogers, RLA

Landscape Architect / License 3223

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