



## The Surface Temperature Record and the Urban Heat Island

Filed under: **Instrumental Record**— william @ 6 December 2004

There are quite a few reasons to believe that the **surface temperature record** – which shows a **warming of approximately 0.6°-0.8°C over the last century** (depending on precisely how the warming trend is defined) – is essentially uncontaminated by the effects of urban growth and the **Urban Heat Island (UHI) effect**. These include that the land, borehole and marine records substantially agree; and the fact that there is little difference between **the long-term (1880 to 1998) rural (0.70°C/century) and full set of station temperature trends (actually less at 0.65°C/century)**. This and other information lead the IPCC to conclude that the UHI effect makes at most a contribution of 0.05°C to the warming observed over the past century.

More recently two papers have sought to show directly that the effect is minimal. David Parker in a **recent paper in *Nature***, said:

Urban heat islands occur mainly at night and are reduced in windy conditions. Here we show that, globally, temperatures over land have risen as much on windy nights as on calm nights, indicating that the observed overall warming is not a consequence of urban development.

The reasoning behind this is that the major cause of urban heat islands is the reduced cooling that occurs at night when the “view to space” of the surface is blocked by buildings. In more rural areas, cooling can be stronger. This is more likely to occur in calm conditions, when air near the surface is less well mixed with air higher up. Since the UHI effect is reduced in windy conditions, if the UHI effect was a significant component of the temperature record, then we would see a different rate of warming when observations are stratified by calm or windy conditions. The absence of such an effect (which is what Parker finds) is, conversely, evidence of a minimal UHI effect on the record.

The Parker paper, however, is very brief and recent and has not had time to be fully tested by the scientific community. A paper by Peterson (2003) is of interest because it has been out for a while and is more comprehensive. It agrees with Parker. The paper, “Assessment of urban versus rural in situ surface temperatures in the contiguous United States: No difference found” published in the *Journal of Climate* finds that the effects of the urban heat island may have been *overstated* and that “Contrary to generally accepted wisdom, no statistically significant impact of urbanization could be found in annual temperatures.”. This was done by using satellite-based night-light detection of urban areas, and more thorough homogenisation of the time series (with corrections, for example, for the tendency of surrounding rural stations to be slightly higher, and thus cooler, than urban areas). As the paper says, if its conclusion is accepted, then it is necessary to “unravel the mystery of how a global temperature time series created partly from urban in situ stations could show no contamination from urban warming”. The main conclusion is that micro- and local-scale

impacts dominate the meso-scale impact of the urban heat island: many sections of towns may be warmer than rural sites, but meteorological observations are likely to be made in park “cool islands”.

The evidence points to a warming of about 0.6-0.8°C over the past century and a negligible effect on this from the UHI. While some ‘contrarians’ appear determined not to accept this finding, the evidence they cite appears thin indeed compared with the published research.

### References:

Parker, D.E., **Large-Scale Warming is not Urban**, *Nature* 432, 290, doi:10.1038/432290a, 2004.

Peterson, T.C., Assessment of urban versus rural in situ surface temperatures in the contiguous United States: No difference found, *Journal of Climate*, 16, 2941-2959, 2003.

---

Powered by **WordPress**