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A STUDY ON HEAT ISLAND INTENSITIES AT THIRUVANANTHAPURAM ON A COLD WINTER NIGHT

It has been noticed that the cities are warmer than the surrounding rural areas due to population concentration, industrial activities and vehicular traffic. This is more pronounced at night when light winds and clear skies are experienced. Such conditions lead to a wind pattern that would converge towards centre of the warm pockets known as 'heat islands'. Due to convergence of the surface wind towards the centre of the heat island, concentration of pollutants inside and over the city areas increases many fold. A detailed study of the temperature field over cities will facilitate in understanding the modifications of the urban boundary layer and the consequent effects on the concentration or dispersion of air pollutants.

There have been several attempts to map urban temperature field of thickly populated and highly industrialized cities like Delhi (Bahl and Padmanabhamurthy, 1979), Mumbai, Pune (Daniel and Krishnamurthy, 1973), Chennai (Jayanthi, N., 1988) *etc.* in India. This study attempts to present the results of the first comprehensive mobile temperature survey made at the City of Thiruvanthapuram (Lat. 8° 29′ N, Long. 76° 57′ E) situated on the southwest coast of India and is a classical example of a semi urban area. With only a few industries to contribute to industrial pollution, the major hazard of pollution is from human activities and vehicular traffic.

The heat island effect is most prominently noticed around the minimum temperature epoch when the temperature curve is more or less flat. Generally, the time between 0200 hr IST and sunrise will indicate very little variation in temperature. Hence a mobile temperature survey was conducted on 13th February 1998 between 0215 hr IST and 0530 hr IST. Intercomparison of psychrometer was made with the screen thermometers before and after the survey. The survey team took temperature observations from 44 chosen sites scattered evenly in and around Thiruvananthapuram city (Table 1). The route followed by the survey team is shown in the Fig. 1. Circular marks on the route indicate the spots where the temperature observations were taken. To obtain the trend of temperature, data from thermograph at Thiruvananthapuram Meteorological office was used. These trends are used to reduce the observed temperature values to a single time of 0530 hr IST. The team encountered calm wind conditions over the entire survey route and the sky was cloud free. These provided ideal conditions for the establishment of heat island.

The result of the survey is presented in Fig. 2. One of the warm pockets (heat island) is found over a small area covering Chalai, East Fort, Vanchiyoor, Secretariat and Palayam with an extended tongue towards Medical college. It is interesting to note that the warmest area is located inside this belt over Thampanoor where the Thiruvanthapuram Central Railway Station and Kerala State Road Transport Corporation Bus Stand are located. The second heat island is located over Sankumugham-Vettukad area near the sea coast. This is evidently due to the presence of two major factories *viz.* Travancore Titanium Products and English India Clay Ltd. and also Thiruvananthapuram International Airport. The highest temperature contrast between the city and its rural outskirts is observed to be 2.2°C.

TABLE 1

Observed and reduced temperature at different places in Thiruvananthapuram city on 13 February 1998

S. No.	Name of the place	Observed temperature	Reduced temperature
1	Observatory	26.0	24.6
2	Vellayambalam	26.0	24.6
3	Sasthamangalam	26.2	24.9
4	Maruthamkuzhi	25.4	24.1
5	Vattiyoorkavu	25.2	24.0
6	P.T.P. Nagar	25.2	24.0
7	Valiyavila	25.5	24.4
8	Kundamonkadavu	24.8	23.7
9	Thirumala	25.2	24.1
10	Pangode	25.2	24.1
11	Poojappura	25.4	24.3
12	Jagathy	25.2	24.1
13	Vazhuthacaud	26.0	24.9
14	Palayam	26.5	25.5
15	Secretariate	26.5	25.5
16	Vanchiyoor	26.6	25.6
17	East Fort	26.6	25.6
18	Thampanoor	26.7	25.8
19	Chalai	26.4	25.5
20	Karamana	26.5	25.6
21	Kaladi	25.4	24.6
22	Manacaud	26.0	25.2
23	Kamaleswaram	25.6	24.8
24	Thiruvallam	25.4	24.7
25	Muttathara	25.4	24.7
26	Poonthura	25.7	25.2
27	Valiyathura	25.6	25.1
28	Shankumugham	26.0	25.5
29	Vettukad	26.0	25.6
30	Veli	25.5	25.1
31	Thumba	24.8	24.2
32	All Saints College	25.0	24.6
33	Chakka	25.4	25.1
34	Pettah	25.6	25.2
35	Kannammula	24.8	24.5
36	Kumarapuram	25.4	25.1
37	Medical College	25.8	25.5
38	Sreekaryam	24.8	24.5
39	Ulloor	25.7	25.4
40	Kesavadasapuram	25.5	25.2
41	Nalanchira	25.0	24.8
42	Peroorkada	24.5	24.4
43	Kowdiyar	24.6	24.6
44	Pattom	25.1	25.1

Fig. 1. Route followed by the survey team

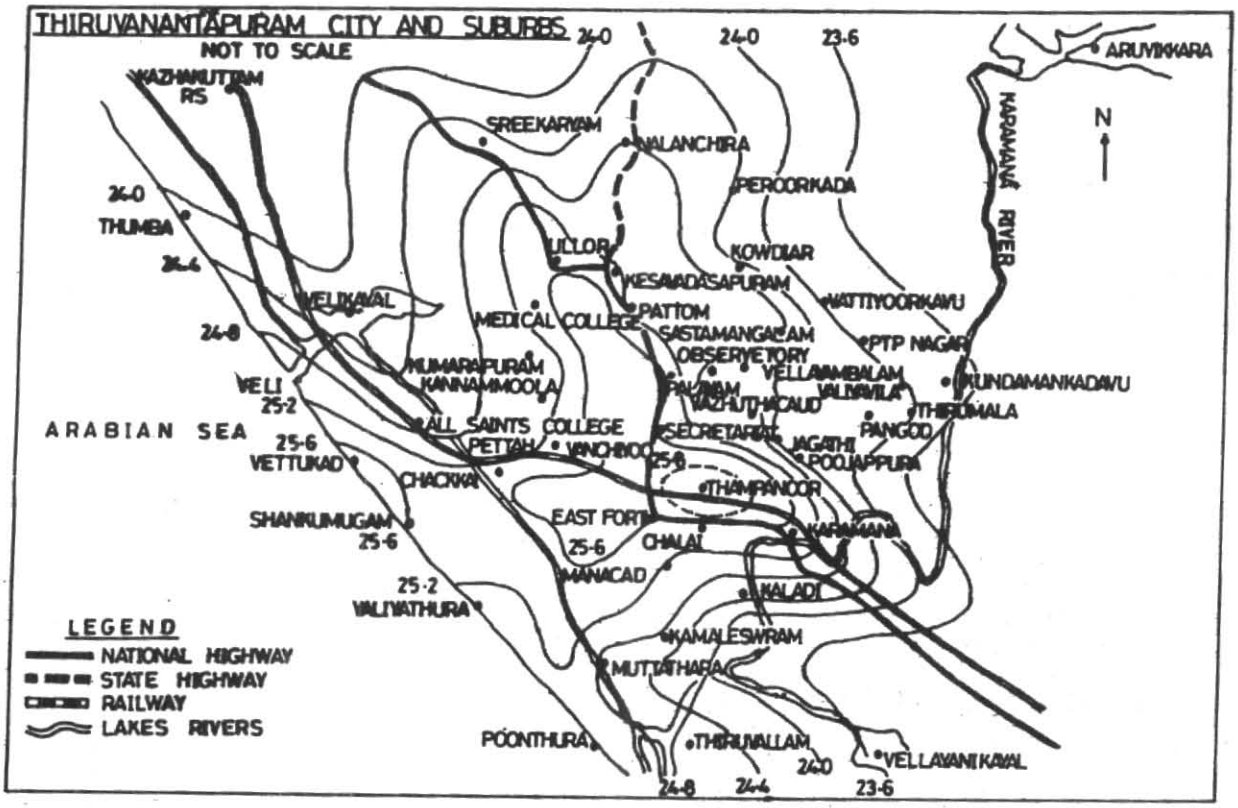

Fig.2. Isolines of heat island intensity at Thiruvananthapuram on 13 February 1998

The heat island intensity of 2.2.°C found at Thiruvananthapuram city on a cold winter night is comparable with most of the medium to large towns. In the case of Thiruvananthapuram city, the major contributor in development of heat island appear to be vehicular traffic followed by human activities. The contribution from the industrial pollution is conspicuous in the case of second heat island located near the industrial area.

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