



# Prof. Dr. Carl Leonetto Amos

**Title:** Emeritus Professor

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## Speaker Biography:

- Over 250 scientific publications on coastal oceanography and sediment dynamics
- Royal Society Travelling Fellow (1973/74)
- Canadian Post-doctoral Fellowship (1974-1977)
- Canadian Government Research Scientist (1977-1999)
- Reader in Oceanography, University of Southampton (1999-2003)
- Professor in Oceanography, University of Southampton (2003-2017)
- Emeritus Professor in Oceanography, University of Southampton (2017 – present)
- Coordinator of numerous short courses on coastal protection (Argentina, Ghana, Philipines, Italy, Canada, UK).
- Lecturer at IMO (Trieste) (2006-2010)
- Co-researcher with CNR\_ISMAR (Venice, Italy) on impact of MOSE in Venice lagoon.

## Presentation **Local Heat Generation and the Coastal Environment**

### Title:

### Abstract:

It is a thermodynamic principal that energy and heat are equivalent (Penrose, 2004, p289). The more energy we generate, the more heat we produce. Therefore, there is no such thing as green energy. Radiation into space is only one way to redistribute/dissipate this heat, whereas at the local scale local radiation, conduction and convection by air and water often dominate. The global increase in solar energy is estimated to be 300 TW. The built environment generates approximately 6% (18 TW or  $18 \times 10^{12}$  W) of the global heat increase (Ritchie, 2024): most of this heat is generated in urban/industrial centres (cities) where more than 50% of the global population now live. Fifty percent of this energy is consumed in domestic heating/cooling. This source is increasing and has increased 6-fold since 1950. The total urban area has doubled since 2020 to about 471,000 km<sup>2</sup> or  $4.71 \times 10^{11}$  m<sup>2</sup>. The domestic energy contribution alone translates to an added urban heat source of close to 20 W/m<sup>2</sup> in urban regions creating the well known “heat island effect” (U.S. EPA. 2016). This compares to a global mean net value increase of  $0.90 \pm 0.15$  W/m<sup>2</sup>. Longhurst (2023) presents numerous examples of the temperature trends in urban centres and shows that the increases are strongly linked to economic and industrial development at local and region scales and are mostly different from, and greater than, the global trends (WMO, 2023). Similar findings have recently been detected in temperature records from the Great Lakes, western Canada (Amos et al., 2014), and southern England (Kassem et al., 2020). In Kuwait, Al-Rashidi et al. (2008) has shown that local sources of heat are dominant over regional and global drivers in the upper Arabian Gulf coastal waters. We shall explore this heating further in the presentation.