



University of
South Australia



Barbara Hardy
Institute

Paul Sutton

Research Profile

Research Area Specialisation

Ranges across such diverse areas as ecology, economics and philosophy with most of the specific research focused on applied issues associated with the Human-Environment-Sustainability problematic.

Paul's research involves a great deal of work with night-time satellite imagery derived from the Defense Meteorological Satellite Program's Operational Linescan System (DMSP OLS). Data products derived from DMSP OLS imagery are used to map and estimate human population distribution, energy consumption, economic activity, urban sprawl, CO² emissions and other areas.

Tools used by Paul include remote sensing, geographic information analysis and statistical analysis. He is specifically interested in the development of the discipline of ecological economics and uses his expertise in GIS and spatial data analysis in collaboration with economists and ecologists to make spatially explicit valuations of ecosystem services.

Contributing to a better and sustainable environment

From the perspective of ecological sustainability, current patterns of urbanization range from good to bad to ugly. Many environmental crises stem from the metabolic inefficiency of our cities; nonetheless, there are no established measures of urban metabolism. Paul's use of daytime and night-time satellite imagery helps to map the 'supply' of planetary resources and the 'demand' of human activity respectively.

The maps of Natural and Built capital are used to create urban 'vital signs' that serve as proxy measures of urban metabolism. These 'vital signs' will help to identify those behaviours of 'Smart Cities' which will be needed to understand and guide us through an urban transformation of this planet that is both sustainable and desirable.

Thanks to the technological advances in night-time satellite imagery --derived from the Visible Infrared Imaging Radiometer Suite (VIIRS) instrument—Paul is confident that he will be able to produce global representations of human constructed impervious surfaces.



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*Great Research
into Sustainability*

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People

- Our researchers are scientists, engineers and social scientists
- We work collaboratively on real-world issues
- Over 100 researchers and 130 research students

Projects

- Multidisciplinary projects focused on sustainability
- We work in partnership with government, industry and academia
- Extensive testing and evaluation services and consultancy expertise
- Our work is underpinned by community participation and education

Paul will use these representations of impervious surface as a proxy measure of human and built capital. He will also use global land cover datasets to make similar global representations of natural capital (with a spatial resolution on the order of 1 km²), to allow for unprecedented studies of the ecological footprint of those urban areas. This information will help to answer the question of *what is the spatial extent of hinterlands (agriculture, forest, grassland, watershed, etc.) that this urban area needs to satisfy its current population and consumption.*

Research Abstract

Paul's has worked closely with one of his PhD Students, Tilottama Ghosh, in the modelling of economic activity using the DMSP OLS data products. They successfully developed methods for estimating the fraction of the national economy of India and Mexico that comprises the informal sector and mapped it. Paul and Tilottama also produced the first global map of GDP per capita at 1 km² spatial resolution. This work, that relates the estimation and mapping of economic activity using nocturnal satellite observations, is gaining traction with researchers at Yale and the University of California Los Angeles (UCLA).

Research areas of interest

- The development of urban metabolism metrics using satellite imagery
- Economic valuation of urban ecosystem services
- Visualising urban-hinterland dependencies

Barbara Hardy Institute

With the support of the Barbara Hardy Institute Paul has submitted an ARC Future Fellowship proposal to build a globally uniform framework, derived primarily from objective satellite measurements that will serve as a platform to compare and contrast more detailed urban analyses. This has the potential to be a transformative contribution to a Global Earth Observation System of Systems (GEOSS) envisioned by the Group on Earth Observation.

Keywords to describe Paul's research

- Sustainability science
- Population geography
- Ecological economics
- Night-time satellite imagery



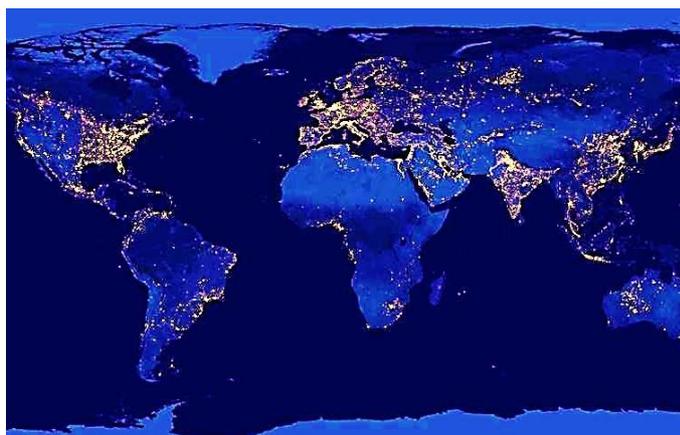
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"Mapping the Natural and Built capital in different regions of the world will assist us in the urban transformation that the planet needs to become a sustainable and desirable home."