



NEWSLETTER

MAY 2007

Statistical analysis of complex data and mathematical models are central to environmental issues, from global to local, even though they are not often discussed. Here we highlight how Data Analysis Australia works with environmental scientists to solve problems affecting us all.

*Dr John Henstridge
Managing Director*

Measuring Our Environment

While everyone recognises the importance of the environment, there is frequent debate about how serious some issues are and what actions are appropriate. Much of the debate at every level – from global to local – reflects a lack of knowledge, and this in turn reflects difficulties in measuring environmental systems. Statistics has a key role in making decisions in the presence of such uncertainty.

Global warming is a large scale example of this. The first hint of warming was published in the 1970s, based on long term measurements at a number of sites in the northern hemisphere. However the data was not always reliable, coming from many weather stations of varying quality, the analysis difficult with a spatial as well as a temporal aspect and the temperature change small, leaving the overall findings questionable. Now with more data and more refined statistical analysis, the reality of global warming is generally accepted and the debate has moved on to effects and actions.

At the local level, the problems are the same but less dramatic. Questions of whether an environment has been affected involve detecting change amid the natural variation. This leads to a need to quantify and understand natural variation and the setting of quantitative guidelines for what is an acceptable impact.

A common problem in environmental measurement is the high cost. For instance sampling at less accessible locations, such as on the seabed or in an exhaust stack, can make data collection expensive. Some environmental variables such as odour are inherently difficult to measure. Biological measures such as species counts or population estimates and epidemiological variables are also challenging. Planning and the optimisation of data collection are essential to keep costs reasonable while ensuring that the critical questions can be answered.

The amount of data required is determined by the variability and the efficiency of the analysis, both of which are statistical issues. Involvement of statisticians in the planning of data collection can lead to significant savings as well as giving an assurance that it will be fit for its purpose. The statistician also provides an objectivity that is critical when considering emotional environmental issues. Accredited Statisticians follow a professional code of ethics that emphasises this independence.

Data Analysis Australia has collaborated with a number of clients in this area. Where possible in these studies the first step involved statistical analysis of existing data to gain an understanding of natural variation and measurement errors in a cost-effective way. These analyses led to the design of optimal sampling methods to contain costs while achieving the required precision. Environmental projects Data Analysis Australia has been involved in include monitoring runoff from mine sites, analysing relationships between emissions and odour and a baseline study of benthic (bottom dwelling) communities in Cockburn Sound.



For further information on Data Analysis Australia's services in this area contact **John Henstridge**.

Case Study

The Perth and Regions Travel Survey was a four-year study that resulted in a high quality and geographically balanced dataset of day-to-day travel. This result was achieved through innovative sampling design, personal delivery and collection of questionnaires and intensive quality control procedures. Read more about how Data Analysis Australia accomplished this for the Department for Planning and Infrastructure and Main Roads WA in the latest case study.



See:
www.daa.com.au/casestudies/case_parts.html

Staff Profile



DanceSportPhoto.net

Natalie Smith joined Data Analysis Australia in 2004 after graduating from the University of Western Australia in Computer and Mathematical Sciences. She has experience in a range of areas, including mathematical modelling and surveys, particularly where programming skills are required.

Natalie has used linear programming in projects for the West Australian government to provide information for forward planning. For the Department of the Attorney General, she used this technique to give the optimal locations for Magistrates Courts, taking into account the number of offences that occur in different suburbs and minimising travel required by court users.

In addition to her mathematical skills, Natalie is a talented ballroom dancer (see photo!). She was recently placed 7th in the Australian Championships, and will be travelling to England to compete in the Blackpool Dance Festival this month.

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Company News

Rhiannon Marchant and **Jason Rabbitt**, two of our Consultant Statisticians attended the Young Statisticians Conference in Canberra in April. Rhiannon presented a talk entitled *What is a Statistical Consultant's Job?*, while Jason spoke about his work on a *Comprehensive Baseline Study of Cockburn Sound*. Copies of their presentations are available at: <http://www.daa.com.au/presentations/index.html>. Congratulations to Jason, who won the prize for the best presentation by a Young Statistician.

Anna Munday and **Scott Brown** attended the Australian Mathematical Sciences Institute's industry workshop on *The Mathematics of Electricity Supply and Pricing*, held in Surfers Paradise in Queensland in April.

We welcome our newest Consultant Statistician, **Rian Caccianiga**. Rian recently graduated from Murdoch University with honours in Mathematics and Statistics. She completed a double major in Mathematics/Statistics and Marine Science and has experience in environmental modelling and analysis, including simulation.

Also joining us as a Consultant Statistician is **Alex Maund**. Alex hails from the UK with a degree from the University of Bath and has experience working as a mathematician and statistician for the Ministry of Defence and the Food Standards Agency.

We bid a (temporary) farewell to **Dr Linda Eaton**, who begins maternity leave. We wish Linda and Peter all the best for the upcoming birth.

Jodie Thompson, Perth Branch Manager, was awarded her Executive Masters of Business (EMBA) at a March graduation ceremony at the University of Western Australia. The two-year part-time EMBA program is designed to extend the leadership and management skills of senior managers.

Classic Quote

"To call in the statistician after the experiment is done may be no more than asking him to perform a post-mortem examination: he may be able to say what the experiment died of."

Sir Ronald Aylmer Fisher.

(Perhaps the most famous statistician of the twentieth century.)

