

## Faculty of Computing Health and Science

### Research Unit Annual Report

**RESEARCH UNIT NAME:** Natural resources Modelling and Simulation Group

**RESEARCH UNIT LEVEL (tick):**

- Level I Research Group       Level II Research Centre  
 Level III Research Institute       Centre of Excellence

**YEAR:** 2010

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**BRIEF OVERVIEW** (1-2 paragraphs outlining major activities conducted in past year)

#### Overview

The areas of interest of the Natural Resources Modelling and Simulation research group are

- time series forecasting
- the development and application of geostatistical simulation and estimation methods for mathematical and statistical modelling in the areas of mining, environmental pollution and fisheries
- spatio temporal modelling of natural resources and health data

In the area of health data the focus was on the development of techniques for the spatiotemporal modelling of malaria data and the spatial modelling of cancer data for the Perth metropolitan area.

**MEMBERSHIP** (Full Title of Researchers, including staff, research students, adjuncts in the past year)

Associate Professor Ute Mueller(Coordinator)

Assoc Professor James Cross

Dr Steven Richardson

Mr Simon Appiah, PhD student

Ms Ainslie Denham, PhD student

Ms Changying Chang, PhD student

Ms Jacqueline Ferreira, MSc student

Mr Phil Savory, MSc student

Mr Robin Dunn, MSc student

Ms Carli Telfer , MSc student

Mr Yuichi Yano, MSc student

**NEW GRANTS** (Identify Funding Body, Value of grant, Years funded, Chief Investigator, collaborators, title)

Funding Body: Riotinto,  
Amount of Funding \$76929  
Years funded: **2010-2011**  
CI: Ute Mueller  
Collaborator: S Richardson, J Ferreira ,  
Title: Application of geostatistical simulation in the determination of material types

Funding Body: WA Department of Fisheries  
Amount of Funding: 1,106510  
Years funded: 2011-2014  
CI: Prof Paul Lavery, V Graham, U Mueller and G Hyndes  
Collaborators: Dr Brent Wise, Ms Karin  
Title Boat based recreational fishing activity in Western Australia: a long term profile

**PUBLICATIONS, REFERRED BOOKS, CHAPTERS, JOURNAL ARTICLES, CONFERENCE PAPERS, REPORTS**

**Refereed Publications**

Aboagye-Sarfo, P, Cross, J and Mueller, U (2010) Trend analysis and short-term forecast of incident HIV infection in Ghana, African Journal of AIDS Research 9 (2), 165-173

Bandarian, E, Mueller, U, Ferreira, J and Richardson, S (2010) Transformation Methods for Multivariate Geostatistical Simulation - Minimum/Maximum Autocorrelation Factors and Alternating Columns Diagonal Centres, in Dimitrakopoulos (ed) Advances in Orebody Modelling and Strategic Mine Planning 1: Old and New Dimensions in a Changing World, The Australian Institute of Mining and Metallurgy, 79-89

Denham, A and Mueller, U, (2010) Incorporating survey data to improve space-time geostatistical analysis of king-prawn catch rate, in Atkinson, P and Lloyd , C (ed) geoENV VII - Geostatistics for environmental Applications. Proceedings of the seventh European conference on geostatistics for environmental applications, Springer,13-26

Hodkiewicz M, Richardson S, Durham R 2010 ‘Challenges and opportunities for simulation modelling integrating mine haulage wand truck shop operations’ In Proceedings of 2010 Australian Mining Technology Conference, 13-15 September 2010, Perth Western Australia, 163-172.

**Conference presentations**

C Shao, Spatial Point Pattern Analysis of breast cancer mortality rates in Perth, 2005, ASC2010, Fremantle, 6-10 December

Y Yano, Generalised linear modelling of asthma hospitalisation risk and air pollutant concentration in Perth, ASC2010, Fremantle, 6-10 December

C Telfer, Spatial assessment of charter fishing in the West Coast bioregion of Western Australia, ASC2010, Fremantle, 6-10 December

U Mueller, Geostatistical simulation of Multivariate Data using MAF and AC-DC methods, ASC2010, Fremantle, 6-10 December

Y Yano, U Mueller and A Hinwood, Generalised linear modelling of asthma hospitalisation risk and air pollutant concentration in Perth, 8<sup>th</sup> International Conference on Geostatistics for Environmental Applications, Ghent, 13-15 September 2010

**HIGHER DEGREE BY RESEARCH LOAD** (list name of candidate and degree type)

Mr Simon Appiah, PhD student  
Ms Ainslie Denham, PhD student  
Ms Changying Chang, PhD student  
Ms Jacqueline Ferreira, MSc student  
Mr Phil Savory, MSc student  
Mr Robin Dunn, MSc student

**HIGHER DEGREE BY RESEARCH COMPLETIONS** (List name, degree, title of thesis)

Yuichi Yano MSc Bayesian and Geostatistical Analysis of the Effect of Air Pollution on Asthma Hospitalisation in Perth

Patrick Aboagye-Sarfo PhD: Time Series Analysis of HIV Incidence Cases in Ghana: Trends, Predictions and Impact of Interventions

Carli Telfer, MSc: The Western Australian Charter Industry: Working towards long-term sustainability

**VISITORS AND COLLABORATIONS** (List the organisation's name and short summary of the nature of the collaboration. Separate into local, national and international)

See below

**COMMUNITY ENGAGEMENT ACTIVITIES AND LINKAGES** (Provide a brief overview of any significant activity)

The following research was being carried out with partners from Riotinto Iron Ore:

- development of a modeling methodology for iron ore material types
- refinement of estimation approaches for specific geological zones

**FUTURE PLANS AND DIRECTION** (Provide an overview)

- Consolidation of the collaboration with the Marine and Fisheries Research Laboratories, WA Department of Fisheries in relation to stock assessment, in particular the geostatistical modeling of indicators, such as trophic level and species richness and the modeling of scallop distributions in space and time
- Development of joint research with Riotinto Iron Ore

- Development of joint research with E Grunsky, Canadian Geological Survey, on the modeling of multivariate compositional data

**DATE OF NEXT FORMAL REVIEW**

To be decided