Ph.D. Candidate

Sam Macharia Ng'ang'a

Graduate Academic Unit

Geodesy & Geomatics Engineering

July 20, 2006

1:30 p.m.

Head Hall Room E-11

Examining Board

Dr. Sue Nichols (Geodesy & Geomatics Eng.)

Co-Supervisor

Dr. John McLaughlin (Geodesy & Geomatics Eng.)

Co-Supervisor

Dr. Shawn Dalton (Environment & Sustainable Development Research Centre)

Dr. Darka Mioc (Geodesy & Geomatics Eng.)

Dr. Michael Ircha (Civil Engineering)

Chairperson

External Examiner:

Dr. Michael Chadwick Fisheries & Oceans Canada Oceans & Science Branch Moncton, N.B.

The Oral Examination will be chaired by:

Dr. Gwendolyn Davies, Dean of Graduate Studies & Associate Vice-President (Research)

BIOGRAPHY

Universities Attended:

University of Nairobi (1996), B.Sc. (*First Class Honors*) Surveying Engineering University of New Brunswick (2000), M.Eng. (Land Information Systems) Geodesy & Geomatics Eng. University of New Brunswick (2004), Diploma in University Teaching, College of Extended Learning University of New Brunswick (2006), Ph. D Candidate

Journals and Book Chapters

- Nichols, S., **S.M. Ng'ang'a**, M. Sutherland, and S. Cockburn (2006). "The Marine Cadastre Concept." Chapter 10 in *Canada's Offshore: Jurisdiction, Rights and Management*, B. Calderbank, A.M. MacLeod, T.L. McDorman, and D.H. Gray (eds.). 3rd edition, Trafford Publishing, Victoria.
- Ng'ang'a S.M., M. Sutherland, S. Cockburn and S. E. Nichols (2004). "Toward a 3D Marine Cadastre in Support of Good Ocean Governance: A Review of the Technical Framework Requirements." *Computers, Environment and Urban Systems Journal*, Cadastral Systems III, Volume 28, Issue 5, September 2004, Pages 443-470.
- **Ng'ang'a S.M** (2004). "New Directions for Coastal and Marine Monitoring: Web Mapping and Mobile Application Technologies." In *GIS for Coastal Zone Management*, Taylor and Francis, UK.
- **Ng'ang'a S.M** and S. Nichols (In press). "Stakeholder Identification and Tenure Information: Lessons Learnt from the Musquash Marine Protected Area in Canada." *Journal of Coastal and Oceans Management*.
- **Ng'ang'a S.M** (In press). "Using Canadian MPAs to Highlight the Need for Improved Tenure Information Management." In *Issues in the Administration of Marine and Coastal Spaces*, Sutherland, M.D. (ed.), International Federation of Surveyors (FIG) Publication.
- **Ng'ang'a S.M** and S. Nichols (In press). "Using Hydrographic Survey Data to Link Coastal Communities and Scientific Research." In *Managing for Sustainability in Canadian Waters*, Walsh, D. and C. Malcolm (eds.), ISER, Memorial University of Newfoundland.

Reports

- **Ng'ang'a, S. M.,** M. Hutchison, K. Vodden, J. Pepper, M. Berry, S. Nichols, M. Sutherland, R. White and B. Nkwae (2004). "A Handbook on Issues Surrounding Linking Science and Local Knowledge in Coastal Areas." *Report for the Department of Fisheries and Oceans, Canada*, 53pp.
- Sutherland M., S. Nichols, **S. M. Ng'ang'a**, M. Hutchison, B. Nkwae K. Vodden, S. Dickie, R. White, M. Berry, and J. Pepper (2004). "Traditional Adaptation Strategies to Sea Level Rise: Canadian Case Studies." *Report for the Department of Fisheries and Oceans, Canada*, 104pp.
- **Ng'ang'a. S.M** (2004). "Musquash Marine Protected Area Awareness, Communication and Education (ACE) Strategy." *Report for the Department of Fisheries and Oceans, Canada*, November, 24 pp.
- Nichols, S., J. Dobbin, **S. Ng'ang'a**, S. Cockburn, M. Sutherland, K. Cove, and T. Beran (2001). "Roles and Responsibilities for Surveying in Offshore Canada Lands." *Report for the Legal Surveys Division, Natural Resources Canada*, September, 80 pp.
- Nichols, S., M. Sutherland, S. Ng'ang'a, and D. Monahan (2001). "Report and Proceedings of the Association of Canada Land Surveyors Offshore Issues Stakeholder Consultation Workshop." *Report for Association of Canada Land Surveyors*, May, 57 pp.

Extending Land Management Approaches to Coastal and Oceans Management: A Framework for Evaluating the Role of Tenure Information in Canadian Marine Protected Areas

Abstract

Canada's approach to coastal and oceans management consists of a complex, multi-layered system of laws, policies, organizations, and strategies. It is a fragmented approach to resource management and results in redundant efforts, inefficiency, ineffectiveness, and lack of coordination among agencies. One of the challenges encountered by Canada's approach is to use, share, and manage information resources effectively.

In particular, there is a need to provide complete and integrated inventories of information to mitigate conflicts among the growing ocean users, as well as to reduce administrative, jurisdictional and regulatory complexities. However, there is no comprehensive strategy to deal with the fractured and incomplete sets of data that are the legacy of the complex administrative and legal structures. Managing that information better should be the foundation for better decision-making regarding coastal and oceans resources.

To address this challenge, this research provides a systems view of marine management with a focus on the role of the information on rights, responsibilities, and restraints in marine space, i.e. the tenure information. Marine management consists of several processes including, administration of marine activities, uses and interests; which depend on management of tenure information.

This research investigates the role of tenure information and its management in implementing the Marine Protected Area (MPA) program by the Department of Fisheries and Oceans, Canada. Stakeholders in MPA establishment (e.g., government planners, environmental interest groups, coastal communities, and individual owners) often only have a vague understanding of the complexity of rights that may exist. Better management of this tenure information can therefore improve stakeholder participation. In this research, a framework for managing tenure information management for Canadian MPAs is designed. This framework is developed from a primary MPA case study - the Musquash Estuary in New Brunswick, and then is tested in a comparative analysis with additional case studies.

The major conclusion of the research is that a framework should be based on three tenure information management activities: (1) determining tenure information requirements; (2) determining tenure information use; and (3) understanding the role of tenure information management groups. These activities facilitate the description of tenure information categories, their characteristics, their management, and their role in MPA establishment. Recommendations on the broader application of this framework in marine space management are also proposed.