Chapter 3
Applying Knowledge Management in the Environmental and Climate Change Sciences

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Category: Application-Specific Knowledge Management

INTRODUCTION

In recent years, the field of knowledge management has built a large foundational research base concentrating on the identification, acquisition, transfer and storage of knowledge. The majority of this research has been situated in the context of organizations, or corporate knowledge. However, knowledge management can have a significant impact on other non-corporate institutions, including scientific organizations focused on the study of the natural environment and global climate change.

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Knowledge management has the potential to make a valuable contribution to the work performed by scientists studying the environment and climate change. As technology improves and the importance of their work becomes more widely accepted, scientists are collecting vast amounts of multi-modal data in order to better understand the earth's natural environment and the changes which are occurring due to natural and man-made forces. Traditionally, these scientists have focused on this data collection process, with the end goal of analysis targeted towards understanding the scientific context of this data. The demand for this analysis normally originated from other scientists.

However, with the realization of the changes in the global climate, demand for scientific knowledge is coming from many other sectors, including government, industry and society. These different

sectors are demanding knowledge about the earth and their activities in order to reduce their impact on the already significant changes in the climate. Environmental scientists are now required to go beyond traditional data collection and analysis, and produce knowledge that is usable by the general public and policy makers in order to support a diverse set of decision making activities. This shift from a data focus to an information and knowledge focus requires new activities, processes and end-products for the scientists. These new activities are putting additional strains on environmental scientists, however by beginning to incorporate knowledge management activities into their work many are successfully generating and sharing knowledge in order to impact policy creation and society's decision making. Knowledge management is providing many of the tools, concepts, ideas and innovations to accomplish this important task.

BACKGROUND

Our world's climate is changing at an ever increasing rate. In order to fully understand why this change is occurring, the effects it will have on the inhabitants of this planet, and what human actions and activities can reduce this change, scientists are collecting increasingly large amounts of environmental data. For example, the National Oceanic and Atmospheric Administration (NOAA) alone collects over one petabyte (10^{15} bytes) of new data annually at its three national data centers, while providing access to an archive exceeding 3.5 petabytes which handles over 100 million worldwide individual data requests each year. These centers have approximately two million worldwide customers (*Environmental Data Management at NOAA*, 2007). For such large amounts of data, data diversity becomes a challenge, with data streams containing data sets from satellite remote sensing imagery, fixed and mobile radars, research aircraft, buoys, research ships, to specific biological studies of ocean species. Other similar scientific communities are also experiencing challenges not unlike those at NOAA in regards to increasing amounts of data and increased reporting demands.

Not all data is of a quantitative or numerical type. Qualitative data on climate change and its impact on society are being collected from environmental stakeholders such as community members, local residents, and indigenous populations. This knowledge greatly enhances the analysis of the quantitative measurements and contributes towards a better understanding of our environment. For example, in North Carolina, scientists are working with residents of the coastal areas to understand their perceptions of the environmental changes occurring in fish stocks, shoreline forests, and available natural lands in order to understand the changes to both fish and mammals who inhabit the area (Griffith, 2006). In countries where the fishing industry plays a prominent role in the economy (Canada, Mexico, Norway, Nigeria), attempts to incorporate local fishermen's knowledge into resource planning and policy making have occurred to enrich the scientific data on populations and migration trends (McGoodwin, 2006). Our understanding of changes in the habitat and availability of sea cucumbers in Indonesia is primarily based on scientists working with the Aruese people who rely on this ocean creature for sustenance (Osseweijer, 2000). Societies who depend on their natural environment as a food source, for their livelihood or other necessities of life tend to build a strong understanding of the environment and can assist scientists in understanding current conditions and ongoing changes. Identifying where this local or traditional knowledge resides, and determining how to acquire this knowledge and integrate it into scientific data collection practices is becoming more important for scientists studying changes in natural environments and global climate. Managing this transfer of traditional knowledge from local communities into the scientific community