TOWARDS A FRAMEWORK FOR DESIGNING SPATIAL AND NON-SPATIAL VISUALIZATIONS FOR COMMUNICATING CLIMATE CHANGE RISKS

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Hazards related to climate change (e.g., intensified storms, coastal flooding associated with sea level rise) are globally pervasive yet geographically-specific problems that demand societal response. Unfortunately, studies have shown that people are often unaware of (or inaccurately perceive) the true risk, thereby limiting their motivation to take steps to lower their vulnerability. Visualization of the anticipated impacts (either spatially or non-spatially) has an important role to play in risk communication, potentially avoiding peoples' cognitive biases, helping to focus their attention, and allowing them to personally evaluate the evidence. In this paper, key findings of the risk perception literature are presented and a conceptual framework provided to help guide: (1) the identification of important information requirements (anticipating the influence of psychological effects); (2) the selection and design of visualizations; and (3) the assessment of the effectiveness of visualizations for enhancing perception of risk and inspiring a public willingness to adapt. A case study involving coastal flooding in South-East New Brunswick is referred to throughout.

Les dangers reliés aux changements climatiques (p. ex., l'intensification des tempêtes et les inondations côtières associées à la hausse du niveau de la mer) se répandent partout dans le monde, mais constituent des problèmes propres à certaines régions du monde qui exigent une réponse sociétale. Malheureusement, les études ont démontré que les gens ignorent souvent le véritable risque (ou le perçoivent mal), limitant ainsi leur motivation à prendre des mesures pour diminuer leur vulnérabilité. La visualisation des répercussions prévues (que ce soit spatialement ou non spatialement) a un rôle important à jouer dans la communication du risque, prévenant potentiellement le biais cognitif des gens, les aidant à centrer leur attention et leur permettant de faire leur propre diagnostic. Dans cet article, les principales conclusions de la documentation sur la perception des risques sont présentées dans un cadre conceptuel qui est fourni pour aider à orienter : (1) le recensement des besoins importants d'information (anticipant l'influence des effets psychologiques); (2) la sélection et la conception des visualisations; et (3) l'évaluation de l'efficacité des visualisations pour améliorer la perception des risques et inspirer une volonté publique de s'adapter. Une étude de cas impliquant une inondation côtière dans le sud-est du Nouveau-Brunswick est utilisée comme référence tout au long de l'article.

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Introduction

Between 1970 and 2004, global greenhouse gas (GHG) emissions grew 70% above pre-industrial levels, largely attributable to anthropogenic activities surrounding the access and use of energy supplies, transportation and industry, and forestry and agriculture [*IPCC* 2007]. By altering planetary energy balance, climate change is expected to lead to increased water stress (too much or too little precipitation), increased damages from extreme floods and storms, changes in species distributions, and increased severity of disease and insect outbreaks [*IPCC* 2007]. While a global problem, the trajectory and intensity of specific impacts will vary depending upon geographic location [e.g., *IPCC* 2007].

Since recognition of the importance of anthropogenic climate change in the 1980s, and debate about mitigation strategies, there has been a subsequent recognition that a certain amount of climate change is inevitable [*Grothmann and Patt* 2005]. This realization has shifted much of the discussion towards how to best prepare people for the subsequent impacts, with research focusing on ways to increase people's adaptive capacity.

Visualization is central to exploratory data analysis (EDA) [*Tukey* 1977; *MacEachern et al*. 1992; *Andrienko et al*. 2003; *Keim et al.* 2005], serving to facilitate spatial reasoning and aid in the construction of scientific knowledge [*MacEachern et al*. 2004a]. Given its demonstrated power to inform and augment our ability to think spatially [*MacEachern* 1994; *MacEachern et al*. 2004b], geovisualization