



Integrated environmental modeling: A vision and roadmap for the future[☆]

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ARTICLE INFO

Article history:

Received 20 July 2012

Received in revised form

2 September 2012

Accepted 4 September 2012

Available online 25 October 2012

Keywords:

Integrated environmental modeling

Community of practice

Roadmap

Model integration

ABSTRACT

Integrated environmental modeling (IEM) is inspired by modern environmental problems, decisions, and policies and enabled by transdisciplinary science and computer capabilities that allow the environment to be considered in a holistic way. The problems are characterized by the extent of the environmental system involved, dynamic and interdependent nature of stressors and their impacts, diversity of stakeholders, and integration of social, economic, and environmental considerations. IEM provides a science-based structure to develop and organize relevant knowledge and information and apply it to explain, explore, and predict the behavior of environmental systems in response to human and natural sources of stress. During the past several years a number of workshops were held that brought IEM practitioners together to share experiences and discuss future needs and directions. In this paper we organize and present the results of these discussions. IEM is presented as a landscape containing four interdependent elements: applications, science, technology, and community. The elements are described from the perspective of their role in the landscape, current practices, and challenges that must be addressed. Workshop participants envision a global scale IEM community that leverages modern technologies to streamline the movement of science-based knowledge from its sources in research, through its organization into databases and models, to its integration and application for problem solving purposes. Achieving this vision will require that the global community of IEM stakeholders transcend social, and organizational boundaries and pursue greater levels of collaboration. Among the highest priorities for community action are the development of standards for publishing IEM data and models in forms suitable for automated discovery, access, and integration; education of the next generation of environmental stakeholders, with a focus on transdisciplinary research, development, and decision making; and providing a web-based platform for community interactions (e.g., continuous virtual workshops).

Published by Elsevier Ltd.

1. Introduction

Integrated environmental modeling (IEM) is a discipline inspired by the need to solve increasingly complex real-world problems involving the environment and its relationship to human systems and activities (social and economic). The complex

[☆] Thematic Issue on the Future of Integrated Modeling Science and Technology.

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