



# How to structure and prioritize information needs in support of monitoring design for Integrated Coastal Management



Pim Vugteveen<sup>a,\*</sup>, Marieke M. van Katwijk<sup>a</sup>, Étienne Rouwette<sup>b</sup>, Lucien Hanssen<sup>c</sup>

<sup>a</sup> Department of Environmental Science, Institute for Water and Wetlands Research, Radboud University Nijmegen, Heyendaalseweg 135, 6525 AJ Nijmegen, The Netherlands

<sup>b</sup> Methodology Department, Nijmegen School of Management, Radboud University Nijmegen, Thomas van Aquinostraat 1, 6525 GD Nijmegen, The Netherlands

<sup>c</sup> Deining Societal Communication & Governance, Peter Scheersstraat 26, 6525 DE Nijmegen, The Netherlands

## ARTICLE INFO

### Article history:

Received 29 May 2013

Received in revised form 23 October 2013

Accepted 29 October 2013

Available online 8 November 2013

### Keywords:

Information Needs

Adaptive Monitoring

Stakeholder Involvement

Wadden Sea

Integrated Coastal Management

Social–Ecological System

## ABSTRACT

Integrated Coastal Management cannot operate effectively without reliable information and knowledge on changes in the environment and on the causes of those changes. Monitoring is essential to provide data needed for a real understanding of socio-economic and ecological functioning in multi-user nature areas. We present a web-based and comprehensive assessment methodology to articulate, structure and prioritize information needs and ensuing monitoring needs. We applied this methodology in the Dutch Wadden Sea Region, which includes a designated UNESCO World Heritage nature reserve. The methodology consists of the following steps: i) exploring social–ecological issues of concern and defining the monitoring scope; ii) articulating information needs expressed as tractable questions; iii) elaborating monitoring needs; iv) grounding in scientific models and current monitoring; v) synthesizing assessment findings into target entities, i.e. analysis variables for monitoring. In this paper we focus on the first three steps. As part of our methodology we performed two online surveys amongst a broad range of stakeholders and amongst monitoring professionals. In the case of the Dutch Wadden Sea Region, main monitoring questions were related to biodiversity and food web relations; effects of fisheries and its pressures on the ecosystem; channel and port dredging; spatial planning and multifunctional use; sustainable energy production; and effects of changing storm regimes due to climate change. Subsequently we elaborated these general issues into analysis variables within five themes. The presented methodology enables large scale and unbiased involvement of stakeholders in articulating information needs in a multi-user nature reserve like the Wadden Sea. In addition the methodology facilitates the input and feedback of monitoring professionals by providing a detailed elaboration of monitoring needs.

© 2013 Elsevier B.V. All rights reserved.

## 1. Introduction

Integrated Coastal Management cannot operate effectively without reliable information and knowledge on changes in the environment and on the causes of those changes. Research and monitoring are key components of an informed process for policy and decision making (Hanssen et al., 2009; Pouwels et al., 2011; Wortelboer and Bischof, 2012). To support evidence-based policy making long-term monitoring is needed to provide better understanding of ecosystem functioning in relation to human use. Long-term monitoring is especially relevant to the Wadden Sea, which is considered as one of the most important tidal areas in the world. Large parts are designated nature reserves and constitute a World Heritage Site since 2009 (CWSS, 2008). Concerns

over the state of the Wadden Sea Region and the impacts of anthropogenic activities have created the need for high-quality, long-term datasets as a basis for an integrated understanding of environmental and socio-economic changes (De Jonge et al., 2012; Kabat et al., 2012). Deficiencies and insufficiencies in relevant data, information, and knowledge have been however reported as main impediments with regard to such an integrated understanding for management (Douvere and Ehler, 2011; Vos et al., 2000).

In the Netherlands the *Wadden Sea Long-term Ecosystem Research* project (WaLTER) has been recently initiated to develop a blue print for an integrated monitoring network for the Dutch Wadden Sea Region ([www.walter.nl](http://www.walter.nl)). Initiated by a number of research institutes and organizations that carry out long-term measurements and research, WaLTER aims to improve and integrate existing monitoring programs, identify and fill possible gaps in the current monitoring network, and make existing and new data more readily accessible (WaLTER Project Team, 2010). Ultimately WaLTER aims to be the main platform for regional adaptive monitoring and learning. Advancement of the WaLTER portal and monitoring network addresses a major challenge identified by Kates et al. (2001), i.e. how to integrate and extend today's operational

\* Corresponding author at: Department of Environmental Science, Institute for Water and Wetlands Research, Faculty of Science, Radboud University Nijmegen, P.O. Box 9010, 6500 GL Nijmegen, The Netherlands. Tel.: +31 24 3652623.

E-mail addresses: [p.vugteveen@science.ru.nl](mailto:p.vugteveen@science.ru.nl) (P. Vugteveen), [m.vankatwijk@science.ru.nl](mailto:m.vankatwijk@science.ru.nl) (M.M. van Katwijk), [e.rouwette@fm.ru.nl](mailto:e.rouwette@fm.ru.nl) (E. Rouwette), [l.hanssen@fo.nl](mailto:l.hanssen@fo.nl) (L. Hanssen).

systems for monitoring and reporting on environmental and social conditions, so that more useful guidance for efforts aimed at a transition toward sustainability is created.

It has been argued that many environmental monitoring systems lack a clear purpose. A mere 'knowing-what-is-going-on' argument often seems to motivate the effort (Vos et al., 2000). However, such a vague argument cannot be used to derive clear objectives and will easily result in 'dataleptomania', i.e. the uncontrolled desire to collect more data. Altogether this may lead to the so-called 'data-rich-but-information-poor syndrome' (Timmerman et al., 2010). Efficient and effective monitoring therefore calls for an explicit articulation of stakeholder information needs as well as their translation into monitoring requirements (Lindenmayer and Likens, 2009; McNie, 2007).

A structured dialog between information users on the one hand, and information producers on the other is essential in order to ensure that information supplied by the monitoring program is tailored to the needs of users and based on best available scientific understandings (Maddox et al., 1999; Sutherland et al., 2011; Timmerman et al., 2000; Vaughan et al., 2007).

A thorough assessment of information needs and their subsequent elaboration into requirements for monitoring network design are explicitly incorporated into the WaLTER project setup. In this paper we describe the respective steps of a web-based and comprehensive assessment methodology to articulate, structure and prioritize information needs and ensuing monitoring needs. We describe the results of its application in the context of adaptive monitoring in the Dutch Wadden Sea Region.

Section 2 introduces the rationale and conceptual framework that underlie our assessment of information and monitoring needs. Next Section 3 describes the methodological steps of our approach. Section 4 reports the results from the performed assessment in the context of Wadden Sea. Finally Section 5 discusses the implications of our findings for socio-ecological monitoring and Integrated Coastal Management in general.

## 2. Monitoring for Integrated Coastal Management

Integrated Coastal Management (ICM) involves a management process cycle that emphasizes the learning aspects of monitoring and evaluation, i.e. *adaptive* management. Adaptive management has been advocated as an approach to deal with the incomplete knowledge about the system being managed, allowing action in the face of uncertainty in the short run while information gaps are filled in over the longer term (Lee, 1999; Loucks et al., 2005; Stem et al., 2005). An adaptive management strategy is highly appropriate for the Wadden Sea Region. The region is characterized by a high level of complexity and dynamics in which social and natural drivers are so inextricably intertwined that the notion of 'social-ecological system' is appropriate (Kabat et al., 2012).

Improved understanding of the complex interplay of natural processes and socio-economic activities in the Wadden Sea region does not only call for an adaptive, but also an *integrative* form of monitoring and management as well. In line with EU principles on ICM (European Commission, 2002) this means collecting data on ecological as well as socio-economic subsystems, and the use of integrative indicators in management (De Jonge et al., 2012).

Furthermore, it has been widely acknowledged that *long-term* monitoring efforts are essential for gaining understanding of complicated social-ecological systems such as the Wadden Sea region. Long-term data are important for many reasons, i.e. defining baseline conditions, detecting and evaluating changes in the ecosystem as may occur in response to management interventions, as well as evaluating responses to disturbances and stresses that act on a long time scale like climate change (Day, 2008; Lindenmayer and Likens, 2009; Parr et al., 2003).

Fig. 1 shows the basic elements required for an adaptive management cycle in the project context of WaLTER. Monitoring is not an end

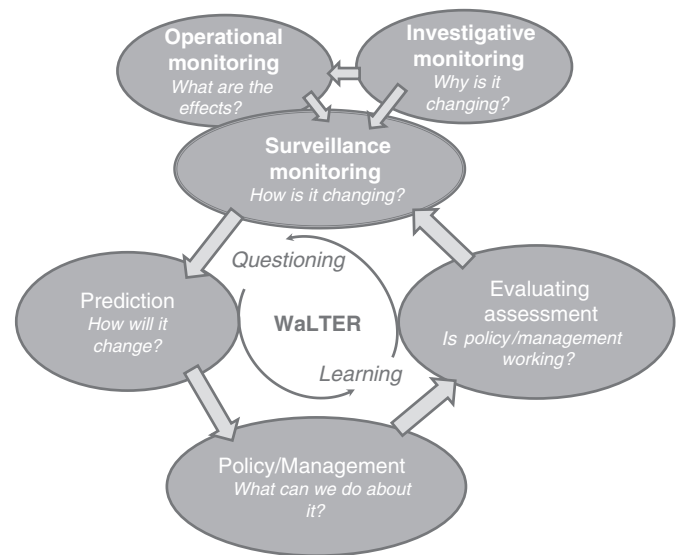


Fig. 1. Adaptive management cycle based on monitoring. The WaLTER project supports adaptive management by addressing (new) information questions and learning, therefore using policy-driven (surveillance and operational) and research-driven monitoring (investigative).

Adapted from Parr et al. (2003).

in itself but derives its function and value from the context in which it is used (Lyons et al., 2008; Nichols and Williams, 2006). Generally monitoring networks perform three functions: signaling, controlling and investigating (Stem et al., 2005). The first two of these functions are mainly policy-driven while investigative monitoring is principally research-driven. These functions are also captured in the types of monitoring used by the European Water Directive, wherein a distinction is made between surveillance, operational and investigative monitoring (European Commission, 2003).

In management, monitoring is needed to evaluate as to what extent that what we are doing is wise, efficient, effective and equitable. This requires the data and information derived from monitoring to be credible, legitimate, and salient. Credibility refers to how authoritative and reliable information is, while legitimacy refers to how fair and respectful the production of information is in terms of considering opposing values, concerns, and perspectives of different stakeholders. Finally salience deals with how relevant and usable information is to decision making bodies or publics. Although these aspects are all critical in relation to monitoring design and effectiveness, they are often neglected (Cash et al., 2002, 2003; McNie, 2007; Timmerman et al., 2001). Credibility challenges monitoring design to be based on robust and state-of-the-art science-based models about the ecological and socio-economic functioning of the system. The WaLTER project aims to develop an online portal for data as well as information products, thereby contributing to information production as well as diffusion. Here legitimacy trade-offs apply to the translation of data into unbiased information, especially information that is produced to support policy-making. The legitimacy aspect is highly significant in complex multi-stakeholder nature reserves like the Wadden Sea where conflicts of interest frequently arise (Floor et al., 2013; Runhaar and van Nieuwaal, 2010). Finally the salience criterion demands that relevant information needs of potential users are taken fully into account in monitoring strategies and design of the data and information portal. These three requirements to information value are to be taken into equal consideration and need to be balanced in the overall design of the WaLTER monitoring network. As the salience of information production is a generally underappreciated aspect of monitoring design (Lindenmayer and Likens, 2009), this aspect will be the focus of this study.

Adopting an adaptive monitoring framework means that monitoring activities can be refined and adapted as new understandings emerge or

Download English Version:

<https://daneshyari.com/en/article/4549834>

Download Persian Version:

<https://daneshyari.com/article/4549834>

[Daneshyari.com](https://daneshyari.com)