Oceans and Society: Blue Planet

Developing global capabilities for the observation and predication of harmful algal blooms

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Abstract

The majority of coastal regions and many freshwater systems across the globe are negatively affected by Harmful Algal Blooms (HABs). The impact of such blooms has grown in recent decades, with regard to public health, ecosystem function, fisheries and aquaculture and recreation/tourism industries (Anderson et al, 2012a). Whilst no comprehensive global study has been conducted, global economic loss due to marine HABs can be estimated at several US$ billion annually. Marine HAB-related losses in the United States are conservatively estimated at ±US$95 million annually, adjusted for inflation (Hoagland and Scatasta, 2006); analogous losses in European coastal waters are estimated at more than € 800 million (Scatasta et al., 2003); HAB-related fisheries losses in Japan have been estimated at more than US$1 billion annually (Kim, 2006). In freshwater systems, potential eutrophication-related losses in the United States, primarily due to cyanobacterial blooms, are estimated at up to US$4.6 billion annually (Dodds et al, 2009); the 1998 season of cyanobacterial blooms in the Lake Tai catchment (China) resulted in estimated economic losses of US$6.5 billion (Le et al., 2010); annual costs of freshwater algal blooms in Australia were estimated at ±A$200 million in 2000 (Atech, 2000), with similar annual eutrophication costs in the United Kingdom estimated at ±US$150 million (Pretty et al., 2003) and in South Africa at ±US$250 million (Frost and Sullivan, 2010). Although predicting the impact of global climate change on HABs is complex, the problem is likely to become more severe through range expansion of harmful species, changes in algal community dynamics and impacts in previously unaffected ecosystems (Hallegraeff, 2010) as well as by previously unknown HAB organisms (Jessup et al., 2009). Increasing eutrophication through on-going development and increased resource pressure is also likely to exacerbate the global HAB problem (Heisler et al., 2008), with the potential for increased proliferation of freshwater and marine cyanobacteria a major concern (O'Neil et al., 2012). Integrated Earth observation-based systems can play a significant role in the detection, monitoring and analysis of HABs in marine and freshwater ecosystems (Jochens et al., 2010). The GEO Blue Planet HAB initiative seeks to consolidate and expand on existing capabilities, building a global community to develop and maximise the use and societal benefits of an integrated HAB observation and prediction system. Such a system would clearly draw strongly upon satellite-derived products, but would also seek to integrate in situ measurements and modelled products, disseminating integrated products through information technology systems as a component of the GEOSS architecture. Whilst the GEO HAB capability is based in Task SB-01-C2, it will offer a combination of Earth observation products, modelling forecasts and information system-based dissemination and will cut across all the Components of the Blue Planet Task, in addition to the WA-01-C4 Global Water Quality Products and Services and GEO Coastal Zone Community of Practice sub-tasks. A very important aspect of the initiative is a strong focus on community building, with the GEO Blue Planet platform seen as an essential impact mechanism for the GlobalHAB global research and development programme –the follow-up to the recently concluded 10–years Global Ecology and Oceanography of Harmful Algal Blooms (GEOHAB) programme.