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Ecosystem services management tool development guidelines and framework revision for industries, industry policy makers and industry groups

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ABSTRACT

The role of industries is important in a holistic ecosystem services management framework that includes government, consumers and private sector. To this end, the need to include more industries into ecosystem services management and conservation is being constantly mentioned by the international community. Here, the purpose of this paper is to find ways to consider industries needs in ecosystem services management better. This was done through identifying aspects that need revising in the current ecosystem services management framework and proposing new guidelines for ecosystem services management tool development. To achieve this, first an ecosystem services dependency management platform for the sectors of the Japanese economy was developed. Second, utilizing this platform and the current ecosystem services management framework, expert evaluation interviews were conducted in order to find potential development aspects. Third, using the results of these interviews, tool development guidelines were proposed and a revision for the framework was conducted. The importance of regularly revising tool requirements and the framework according to new information was underlined.

1. Introduction

1.1. Private sector's responsibilities and opportunities in biodiversity and ecosystem services dependency and impact management

The risks and opportunities associated with ecosystem services are growing. Especially, the risks for industry arise from ecosystem services decline caused by over exploitation, but this situation creates new business opportunities for innovative corporations. A recent study on identifying and managing these opportunities has been conducted by Nidumolyu (2013). The decline of natural systems' capacity has been identified by governments and consumers as well, and this is putting increasingly large pressure on industries to treat their dependencies to and impacts on ecosystems more sustainably (TEEB, 2012). To this end, the need to include the private sector and especially industries into biodiversity and ecosystem services conservation policies is stated in Aichi Targets 2–4 in Strategic Goal A (CBD, 2011). These targets contain guidelines for including biodiversity and ecosystem services into national policy making (Target 2), eliminating incentives harmful to biodiversity and ecosystem services (Target 3), and sustaining the use of natural resources (Target 4).

More recently, the private sector's responsibility was recalled and otherwise mentioned in CBD-COP11 Decisions in October 2012 (CBD, 2012). The utility of The Economics of Ecosystems and Biodiversity (TEEB) in including the private sector into Biodiversity and Ecosystem Services (BES) conservation was stated in this decision. Indeed, TEEB has taken a major role in analyzing the socio-economic benefits of biodiversity and ecosystem services, and will hence be utilized in this paper as well. Some of TEEB's key messages include internalizing environmental costs through policies and encouraging ecosystem services dependency and impact management through government and business incentives (TEEB, 2012). These incentives when implemented would act as drivers for business activities towards more sustainable relationship with ecosystems. Out of the five TEEB studies, this study concentrates on addressing especially the TEEB in Business and Enterprise on an

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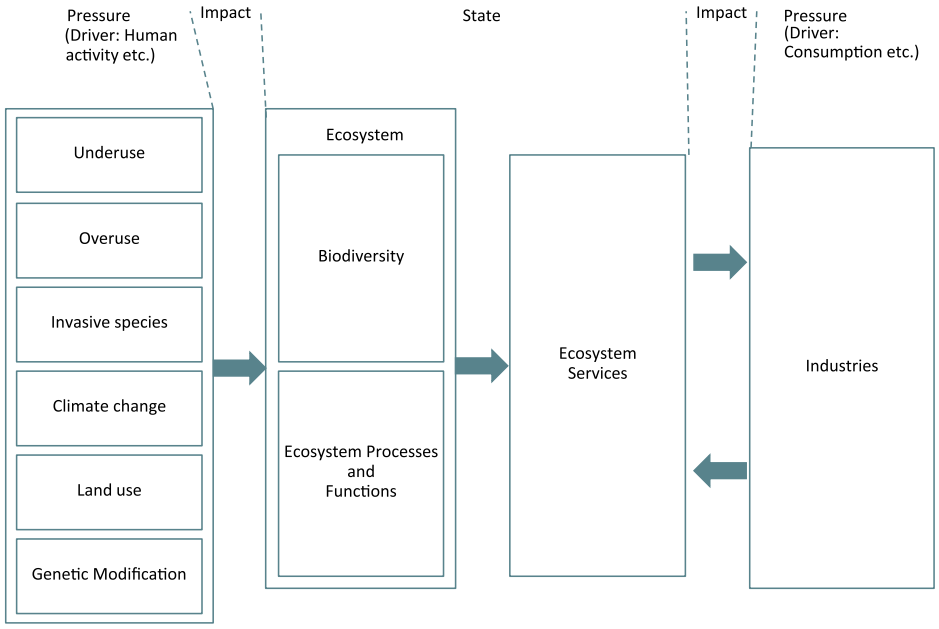

Fig. 1. Current framework.

industry level, and takes the TEEB in National and International Policy making into consideration as well.

1.2. Current ecosystem services management framework and tools

One major current framework that considers industry's risks and opportunities related to ecosystem services management is a framework introduced by TEEB (2010). In this framework, ecosystems and biodiversity contain ecosystem functions that provide ecosystem services. Society uses these services for human well-being and monetary benefits (TEEB, 2010). For to industry, one of the leading ecosystem services management tools is the Corporate Ecosystem Services Review (ESR) (TEEB, 2012). This tool addresses the risks and opportunities that arise from ecosystem services by examining a corporation's dependencies and impacts to ecosystem services (Hanson et al., 2012). A conceptual framework based on TEEB and ESR is shown in Fig. 1.

In Fig. 1, pressures towards changes in ecosystems that arise from human activities but are not necessarily directly linked to industries dependencies on ecosystem services are shown on the left. These pressures are based on Japanese national biodiversity strategy (Underuse) (Ministry of the Environment, 2008), Millennium Ecosystem Assessment (2005) (Overuse, Invasive species, and climate change) and Wolfenbarger and Phifer (2000) (Genetic modification). Underuse, which is defined as the lack of management on human-made natural areas, is included in the framework because of the fact that this paper considers Japan as a case-study as described in Section 2. In Japan, underuse of especially provisioning ecosystem services from forests is a recognized ecosystem service management issue (Ministry of the Environment, 2008). The DPSIR framework (Smeets and Weterings, 1999) is included into the figure to give the framework more structure.

Many ecosystem services related tools for the industry exist within this framework. Among these tools, ESR is a widely used and accepted approach (TEEB, 2012). By 2012, and estimated 300 companies have used or are using ESR (Hanson et al., 2012), one example being a joint study between the United Nations and Nissan Motor Co., Ltd. (Nissan Motor Co. Ltd., 2010). However, there are many other tools for ecosystem services risk management as well. A number of these assessment tools have been analyzed by Waage et al. (2008) and World Business Council for Sustainable Development (WBCSD, 2013). Examples of existing tools include Corporate Ecosystem Valuation (WBCSD, 2011), Life Cycle Impact Assessment Method based on Endpoint Modeling (RISS-AIST, 2004) and a variation of Life Cycle Assessment called Eco-LCA developed at Ohio State University (Ohio State University, 2012; Bakshi and Small, 2011; Baral and Bakshi, 2010; Zhang et al., 2010).

The variety of tools existing today helps us to understand many aspects of the relationships between industries and ecosystems and enables the constructing of strategic plans for managing these relationships more sustainably in ways that suit the framework shown in Fig. 1. However, as we examined this framework carefully, the question whether or not this framework facilitates industry's proactive ecosystem services management activities sufficiently arose. We found the framework straight-forward in the sense that it clearly denotes the need for impact mitigation and dependency management, but here our hypothesis is that this straight-forwardness may mean loss of information due to the intrinsic complexity of nature and its relationship with industry. Therefore important aspects of the interactions between the industry and the nature may be missing. To this end, frequent evaluation and revision of the variety of ecosystem services management tools and their implications is crucial as well.

1.3. Objectives and approach: a study on revising frameworks and tools

The objectives of this study are to find aspects that need the most development in ecosystem services management tools and to revise the framework in Fig. 1 in a way that facilitates the needs of and is beneficial to both industries and ecosystems. This is important due to the hypothesis stated in Section 1.2. Namely, even when the current array of ecosystem services management tools is broad, the current framework in which these tools exist might due to its straight-forwardness overlook the amount and types of benefits industries can achieve from improved management. This in turn simplifies the types of actions companies take and hence all potential avenues in sustainable ecosystem services management are not taken. The following three-step procedure was adopted to achieve the objectives.