Introduction

Ecosystem services (ES) play an increasingly important role in modern coastal research as they are a fundamental concept that can be well used to couple natural and social sciences aspects of Environmental Sciences. Assigning a value to functions of an ecosystem is the logical connection between the given environmental conditions and the wellbeing of the human inhabitants of the assessed region. ES are not only useful with regard to the provision of resources but also when it comes to the regulation of environmental quality and the evaluation of the cultural value of coastal zones. Originally applicable to any kind of ecosystem, they have become the focus of many coastal researchers in recent years since many current assessments include the human-environment interaction in their considerations. Also, ES have become increasingly complex, encompassing more and more possible functions of coastal and marine areas that are of value to humans. This poster provides an overview of the development of the use of ES in coastal research, looking at how the kind of applications have evolved over time leading up to the current state of the art. On the basis of the current understanding of coastal ES, possible pathways for further development of this concept are outlined.

History of Ecosystem Services

ES such as the provision of potable water or food have always been indispensable to humankind and they have been addressed in research implicitly for decades. However, in recent decades the framework of ES as such has come up, been brought to broader attention by the Millennium Ecosystem Assessment carried out by the United Nations Environment Programme (UNEP) between 2001 and 2005. It was called for by United Nations Secretary-General Kofi Annan in 2000 and programme (UNEP) between 2001 and 2005. It was called for by United Nations Secretary-General Kofi Annan in 2000 and had the objective to not only assess the impacts of environmental changes on human wellbeing. It was also supposed to provide the fundamental scientific understanding that is necessary to improve the sustainability of human use of ecosystems. Examples for ES given in the report are clean water, food, forest products, flood control, and natural resources. The Millennium Ecosystem Assessment found major anthropogenic changes of ecosystems since 1950, mainly due to rapidly growing demands for food, fresh water, timber, fiber, and fuel. As a result, a largely irreversible loss in biodiversity was identified. Despite substantial net gains in terms of economic development following the exploitation of ecosystems, a significant progress of ecosystem degradation is predicted for the first half of the 21st century. Avoiding such degradation is crucial for meeting the UN Millennium Development Goals:

1. eradicate extreme poverty and hunger,
2. achieve universal primary education,
3. promote gender equality and empower women,
4. reduce child mortality,
5. improve maternal health,
6. combat HIV/AIDS, malaria, and other diseases,
7. ensure environmental sustainability,
8. develop a global partnership for development.

At least five of these goals are directly influenced by a degradation of ES. Although potentially all of them could be indirectly affected. The rather bleak prognosis regarding the fate of ecosystems and their fundamental importance for so many aspects of human wellbeing sparked a considerable increase in scientific interest and publications on ES and their influences on livelihood, as well as on their degradation and protection potentials from 2005 onwards. Particularly, in research on coastal management and protection this concept was applied very frequently.

Coastal and Estuarine Ecosystem Services

In order to be able to evaluate the impact of human activities on coastal ecosystems, it is necessary to quantify the value that the ecosystems provide to human wellbeing and how this value is affected by anthropogenic changes. This valuation allows the quantitative assessment of different options of coastal zone management by making market and non-market goods and services comparable. Many areas on Earth, particularly island states, small islands, and developing countries, rely on marine products for meeting daily dietary needs. A considerable share of the global population relies on fish as its primary source of protein. Intensive harvesting of marine resources in conjunction with changing environmental conditions can have massive implications for the development of fish stocks as well as the associated fisheries.

Historical development

Coastal and Estuarine Ecosystem Services (CEES) can be divided into four fundamental categories based on their function for humans: regulating services, provisioning services, cultural services, and supporting services. CEES have been found to provide a multitude of direct and indirect gains to humankind.

Regulating Services

The regulating ES are the benefits that are obtained from key regulatory processes in the ecosystems. In coastal zones this can refer to the regulation of the spread of diseases through waste treatment, the buffering of natural hazards, and the regulation of climate effects. In marine ecosystems, waste can be diluted and detoxified by being removed from land and subsequently buried or recycled. Organic waste can be broken down by microbial communities, reducing eutrophication. Representing the interface between land and sea, coasts play an important role in these processes that help averting the spread of diseases.

There are numerous natural hazards to shoreline areas from the open ocean such as storm surges, floods, and storms. In many cases, ecosystems such as mangrove communities or, in case of the German Bight, the Wadden Sea protect coasts from these hazards, acting as buffer zones. Modern flood defense combines human engineering and the protective capacities of coastal ecosystems for an effective protection of coastal areas.

Provisioning Services

Marine ecosystems also provide a variety of products to humans, most of which are retrieved in coastal areas. In addition to seafood and fuel, the filtration of sea water has brought to broader attention by the Millennium Ecosystem Assessment. Marine ecosystems are not only important as a source of seafood and fuel, they are also fundamental for human wellbeing and how this value is affected by anthropogenic changes. This valuation allows the quantitative assessment of different options of coastal zone management by making market and non-market goods and services comparable. The valorization of non-market services by the valuation of ES has been carried out by the United Nations Environment Programme (UNEP) between 2001 and 2005. It was called for by United Nations Secretary-General Kofi Annan in 2000 and had the objective to not only assess the impacts of environmental changes on human wellbeing. It was also supposed to provide the fundamental scientific understanding that is necessary to improve the sustainability of human use of ecosystems. Examples for ES given in the report are clean water, food, forest products, flood control, and natural resources. The Millennium Ecosystem Assessment found major anthropogenic changes of ecosystems since 1950, mainly due to rapidly growing demands for food, fresh water, timber, fiber, and fuel. As a result, a largely irreversible loss in biodiversity was identified. Despite substantial net gains in terms of economic development following the exploitation of ecosystems, a significant progress of ecosystem degradation is predicted for the first half of the 21st century. Avoiding such degradation is crucial for meeting the UN Millennium Development Goals:

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