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Measuring Sustainable Development in the Southern Provinces of Caspian Sea Using the Ecological Footprint Indicator

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Abstract

The Ecological Footprint has emerged as the world's premier measure of humanity's demand on nature. This accounting system traces, on the demand side (Footprint), how much land and water area a human population uses to provide all it takes from nature. This includes the areas for producing the resource it consumes, the space for accommodating its buildings and roads, and the ecosystems for absorbing its waste emissions such as carbon dioxide. These calculations account for each year's prevailing technology, as productivity and technological efficiency change from year to year. One of the most innovative methods to calculate and evaluate the effects of human behavior on the environment and surrounding geography is the method of ecological footprint that has become popular in many communities in recent years. The results of this study show that among (the Southern provinces of Caspian Sea, that is, Golestan, Guilan and Mazandaran, Golestan have 1.786 (ha/per) of ecological footprint (minimal ecological footprint in this provinces) and residents of Mazandaran have 2.106 (ha/per) of ecological footprint (the highest ecological footprint in this provinces).

Keywords: Ecological Footprint, Sustainable development, Biological capacity, Golestsn, Guilan, mazandaran.

Introduction

Per capita ecological footprint (EF), or ecological footprint analysis (EFA), is a means of comparing consumption and lifestyles, and checking this against nature's ability to provide for this consumption. The tool can inform policy by examining to what extent a nation uses more (or less) than is available within its territory or to what extent the nation's lifestyle would be replicable worldwide. The footprint can also be a useful tool to educate people about carrying capacity and over-consumption, with the aim of altering personal behavior. Ecological footprints may be used to argue that many current lifestyles are not sustainable. Such a global comparison also clearly shows the inequalities of resource use on this planet at the beginning of the twenty-first century. Ecological footprint analysis is now widely used around the Earth as an indicator of environmental sustainability. It can be used to measure and manage the use of resources throughout the economy. It can be used to explore the sustainability of individual lifestyles, goods and services, organizations, industry sectors, neighborhoods, cities, regions and nations. Since 2006, a first set of ecological footprint standards exists that details both communication and calculation procedures.

Methodology

The ecological footprint accounting method at the national level is described in the Footprint Atlas 2010 or in greater detail in the Calculation Methodology for the National Footprint Accounts. The National Accounts Review Committee has also published a research agenda on how the method will be improved. There have been differences in the methodology used by various ecological footprint studies. Examples include how sea area should be counted, how to account for fossil fuels, how to account for nuclear power (many studies simply consider it to have the same ecological footprint as fossil fuels), which data sources used, when average global numbers or local numbers should be used when looking at a specific area, how space for

biodiversity should be included, and how imports/exports should be accounted for. However, as new footprint standards emerge, the calculation methodologies are converging.

The Ecological Footprint (EF) is an attempt to quantify sustainability. The EF is based on the fact that every human activity has an impact on the environment through the resources required by these activities and the wastes generated from them. Logic dictates that a certain area of land is required to produce resources and sequester wastes. What differentiates EF from other methods of sustainability assessment is that all human enterprises are reduced to a single dimensional area. Ecological foot-printing itself is based on several assumptions, the primary ones being: It is possible to identify the resources required by an activity and quantify the wastes generated by it. These resources and wastes can then be converted to land area values that are representative of the bio-productive land required to produce the resources and sequester the wastes. The EF represents the critical natural capital requirements of a defined economy or population in terms of the corresponding biologically productive areas (Rees and Wackernagel, 1992). Once values for resource consumption are generated, biological yield conversion factors are used to translate the resource flows into land values. These conversion factors can vary greatly depending on how they are calculated as well as the bio-productivity of the regions on which they are based. The resources themselves are divided into several sections such as housing, transport, consumer goods etc. and this can also vary based on which methodology is used. Once calculated, the per capita footprint can be compared to the global Earth-share, which is the average land availability per person on earth.

Any overshoot above this figure is termed the environmental deficit and indicates the degree to which a population is living beyond nature's means. An easy method for visualizing what the EF means is the example of a modern city with associated resource and waste flows. A large dome covers the city and the only thing that can travel through this dome is light. Naturally, the inhabitants do not survive and the structure of their society breaks down. Imagine if it were possible to stretch this dome so that it encompassed the bio-productive area outside this city. The EF of the city/region is the total area the dome would have to cover in order for the city/region to be able to sustain itself indefinitely with the same levels of consumption. That is the total area required to provide all the resources and sequester all the wastes indefinitely. Thus EFs are practical indicators for the impact or environmental overshoot of a region since high economic demand equates to an excessive resource requirement. This means more land is required to maintain production, which in turn, results in depleted capital stocks. Productive land itself is a good proxy for natural capital since both supply vital ecosystem services.

Results and discussion

The results show that among Southern provinces of Caspian Sea, (i.e., Golestan, Guilan and Mazandaran), Golestan have 1.786 (ha/per) of ecological footprint (minimal ecological footprint in this provinces) and residents of Mazandaran have 2.106 (ha/per) of ecological footprint (highest ecological footprint in this provinces). But since the Ecological footprint of Guilan is larger than the biocapacity, it is unstable compared with two other provinces.

Conclusion

The results of the study show that studied Provinces have the ecological deficit. Therefore, these provinces should be considered in urban and regional planning. Regions require various land uses; protection of farmland, cities, industrial space, transportation hubs and infrastructure, military bases, and wilderness. Regional planning is the science of efficient placement of infrastructure and zoning for the sustainable growth of a region.