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Response to Morse. 2006. "Is Corruption Bad for Environmental Sustainability? A Cross-National Analysis."

Choice of Index Determines the Relationship between Corruption and Environmental Sustainability

Robert M. Ewers [1] *and Robert J. Smith* [2]

ABSTRACT. The Environmental Sustainability Index (ESI) was recently used to investigate links between sustainability and corruption. Here, we show that the ESI contradicts another widely used index of environmental sustainability, the Ecological Footprint (EF), with the result that the most sustainable nations under the ESI are the least sustainable under the EF. Consequently, opposite conclusions can be drawn from investigations into the causes of environmental sustainability, depending on which index is used.

Key Words: *corruption perception index; ecological footprint; environmental sustainability index; ESI; GDP; gross domestic product*

INTRODUCTION

Economic growth in many countries has involved extensive modification of the natural environment, which has led to biodiversity loss and the disruption of important ecosystem services (Millennium Ecosystem Assessment 2005). Thus, although it is vital to identify factors that help reduce these ecological impacts, this process is hampered by the difficulty of quantifying environmental sustainability. In a recent paper, Morse (2006) used the Environmental Sustainability Index (ESI) to investigate links between corruption and sustainability. Corruption has been recognized as a global problem for the conservation of biodiversity (Smith et al. 2003, Laurance 2004, Barbier et al. 2005). Morse (2006) presented results showing that national ESIs and corruption scores are correlated. However, he cautioned against concluding that the pattern involved a causal relationship because of links between these indices and because of complex interrelationships between the indices and income levels.

Here, our aim is to highlight another problem with such cross-national analyses that occurs because the results are intrinsically dependent on how sustainability is quantified. We first describe two commonly used sustainability indices and then repeat the analysis of Morse (2006) to show how researchers may reach different conclusions about the determinants of environmental sustainability, depending on which index is used.

INDICES OF ENVIRONMENTAL SUSTAINABILITY

Environmental sustainability is an ambiguous concept that is inherently difficult to quantify (Parris and Kates 2003). This is because it is an umbrella term that attempts to define how current living standards and human population pressures affect the long-term quality and availability of biodiversity, ecological processes, and other natural resources. A number of indices attempt to assimilate the many component measures of sustainability into a single value (reviewed by Parris and Kates 2003), but we focus here on two that are widely known: the Environmental Sustainability Index (ESI) and the Ecological Footprint (EF).

The ESI integrates 76 different measures that are broadly relevant to the question of environmental sustainability, encompassing natural resource endowments, pollution levels, environmental

[1]Institute of Zoology, [2]Durrell Institute of Conservation and Ecology

management, and the capacity of a society to improve its environmental performance (Esty et al. 2005). Taken as a whole, the ESI presents a powerful method for comparing the relative sustainability of nations, which is promoted by the World Economic Forum. However, a number of objections have been raised that question the validity of the ESI (Morse and Fraser 2005). This is largely because countries with high ESI scores, i.e., those that are seen as being more environmentally sustainable, also tend to have a high per capita gross domestic product. Such a correlation might be expected, given that richer countries are able to spend more on reducing their environmental impacts, but it also seems likely that nations with large economies and high consumption patterns are less environmentally sustainable than developing nations.

A second widely used measure of environmental sustainability is the EF. This index attempts to directly quantify the land area required to support the consumption of a population using currently available technology (Wackernagel et al. 1999, van Vuuren and Bouwman 2005) and communicates human dependence on natural ecosystems (Deutsch et al. 2000). Thus, the EF differs from the ESI in that it converts human activities to a common unit of measure, i.e., physical area, giving low scores for the most environmentally sustainable nations. This index has also been the subject of much debate (see Costanza 2000), with most criticism focusing on underlying assumptions of the EF with regard to international trade, the development of new technology, and the resilience of ecosystems to anthropogenic pressures (Deutsch et al. 2000, Scheffer et al. 2001).

In addition, debate about the value of both the ESI and EF often fails to emphasize the role of the outsourcing of polluting industries and environmental degradation when measuring sustainability within national borders (Lambin et al. 2001, Geist and Lambin 2002, Mayer et al. 2005). However, despite the clear shortcomings of environmental sustainability indices, they remain the only available method for summarizing the breadth of the measures that are required to quantify sustainability at the national level.

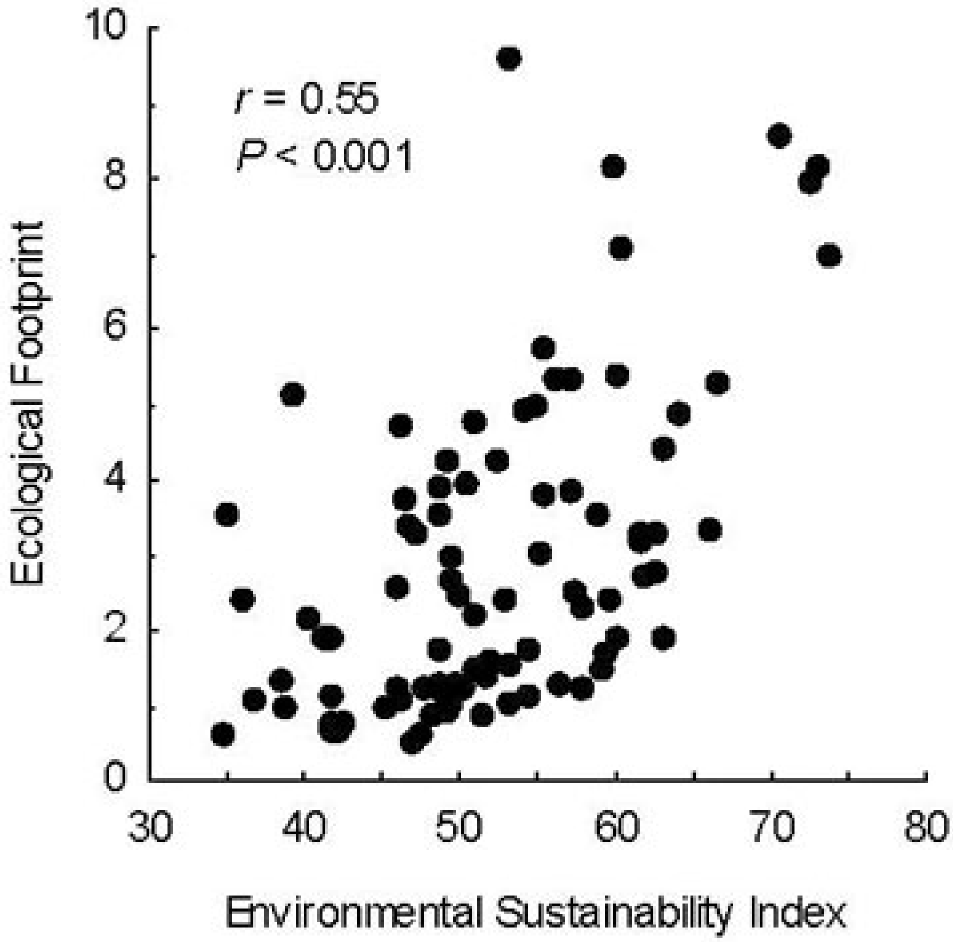
CONTRASTING PATTERNS OF ENVIRONMENTAL SUSTAINABILITY INDICES

The first step in comparing the results of using the Ecological Sustainability Index (ESI) and the Ecological Footprint (EF) in governance analyses is to investigate the relationship between them. Surprisingly, although both the ESI and EF are designed to quantify the same concept, they provide very different pictures of environmental sustainability at the global scale ($r = 0.55$, $N = 89$, $P < 0.001$; Fig. 1). This strong correlation between the two indices indicates that the nations that are the most sustainable under the ESI are the least sustainable under the EF. Thus, these two measures of environmental sustainability contradict each other.

The immediate consequence of having two conflicting indices of environmental sustainability is that patterns such as those reported by Morse (2006) can be reversed, depending on which index is chosen (Fig. 2). Morse (2006) reported a positive correlation between the Corruption Perception Index (CPI) and the ESI, which we corroborated ($r = 0.53$, $N = 89$, $P < 0.001$; Fig. 2A). The CPI is produced by Transparency International (www.transparency.de) and combines survey-based perceptions of corruption that are gathered from a variety of sources, including the World Economic Forum and the World Bank (Morse 2006). The positive correlation between the CPI and ESI indicates that increasing levels of corruption are correlated with decreasing sustainability. However, there is a similar positive relationship between the CPI and EF ($r = 0.82$, $N = 89$, $P < 0.0001$; Fig. 2B), indicating that corruption and sustainability increase hand in hand.

We agree with Morse (2006) that direct correlations of this nature do not provide an accurate understanding of the link between corruption and sustainability. Rather, as Morse (2006) noted, there is a very strong correlation between the CPI and national income levels as represented by the per capita gross domestic product or GDP ($r = 0.82$, $N = 89$, $P < 0.0001$), such that corruption levels are lower in wealthy nations than in poor nations. Thus, we followed the methods of Morse (2006) and used the residuals of the regression between CPI and per capita GDP as a measure of corruption with the influence of income removed. As seen in Fig. 2C, there was no correlation between residual CPI and ESI ($r = 0.19$, $N = 89$, $P = 0.07$), but Fig. 2D shows

Fig. 1. Correlation between the Environmental Sustainability Index (ESI) and the Ecological Footprint (EF). High values of ESI indicate high sustainability, whereas high values of EF indicate low sustainability. The ESI and EF data are for 2002 and 2000, respectively.

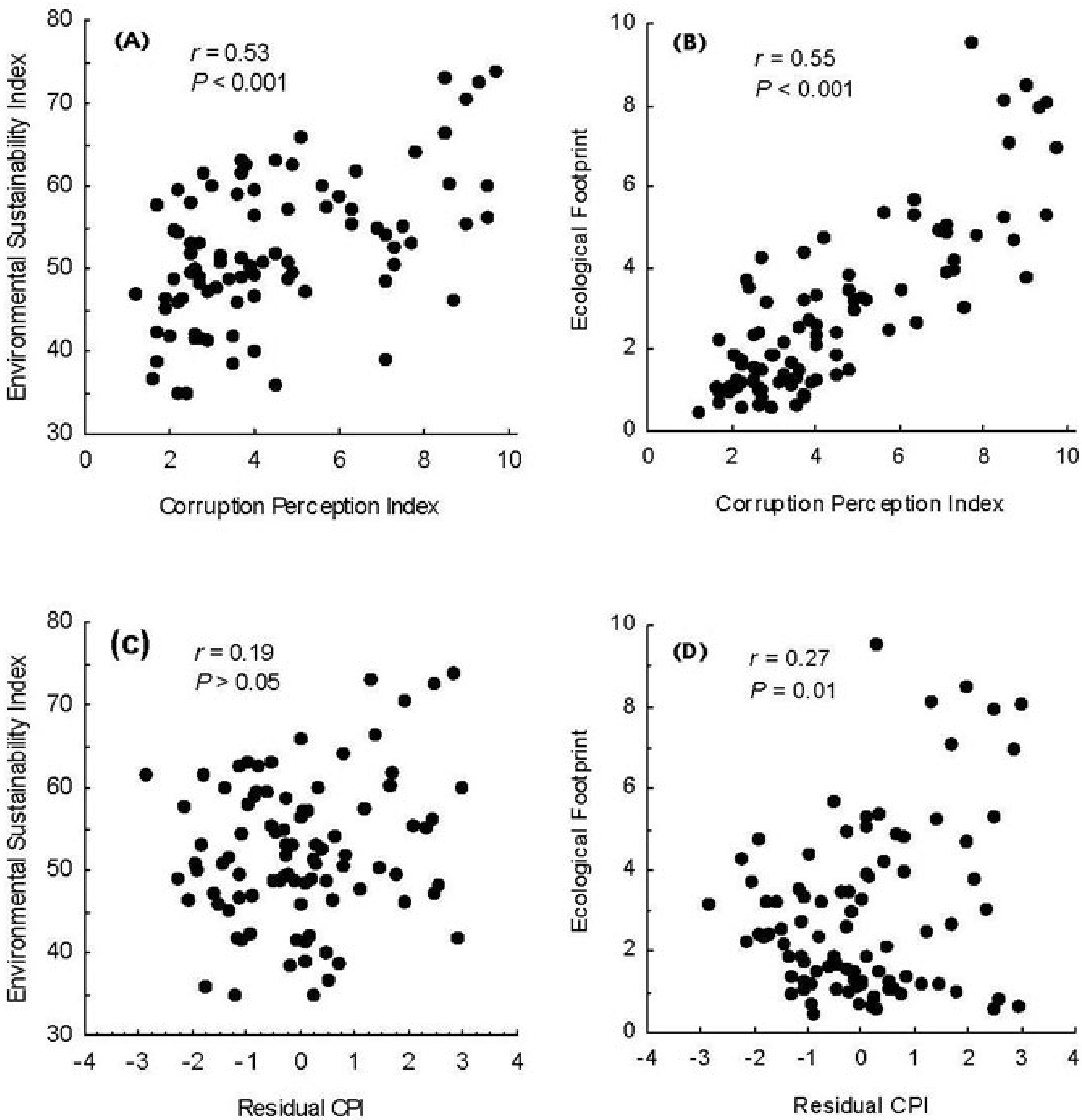


a positive correlation between residual CPI and EF ($r = 0.27$, $N = 89$, $P = 0.01$), indicating that countries with lower governance scores tend to have higher EF values. Corruption can negatively affect air and water pollution levels (Welsch 2004), so it is possible that a similar pattern occurs with environmental sustainability. However, this should be seen as a preliminary result because our analysis did not include data on a range of other factors that may be important.

CONCLUSION

Poor governance has a range of impacts on social and economic development and thus is also likely to affect a range of environmental issues. Research on environmental sustainability is needed to understand and modify the consequences of corruption, but our results show that this is hampered by issues related to how environmental sustainability is measured. Corruption had both positive and negative correlations with environmental

Fig. 2. Correlations between (A) the Environmental Sustainability Index (ESI) and the Corruption Perception Index (CPI), (B) the Ecological Footprint (EF) and CPI, (C) ESI and residual CPI, and (D) EF and residual CPI. Residual CPI represents corruption levels after the removal of the confounding influence of the per capita gross domestic product (GDP). High values of CPI and residual CPI indicate low corruption; high values of ESI indicate high sustainability; high values of EF indicate low sustainability. The per capita GDP, CPI, and ESI data are for 2002, and the EF data are for 2000.



sustainability, depending on which index was used. In addition, the results differed between indices when income-adjusted corruption scores were used. Obviously, conflicting sets of results cannot both be correct, and we are left with the need to make a judgement about which index is the most suitable.

The Ecological Footprint (EF) index quantifies the amount of land required to support the consumption patterns of current human populations. The strong advantage of this approach is that it converts human activities to a single, physical unit that has finite availability in the real world: land area. As such, the EF is an easily interpreted index. In contrast, the Ecological Sustainability Index (ESI) combines data on a large number of social, political, and environmental variables to generate a weighted index of environmental sustainability that reflects a wide variety of sometimes conflicting information that is not easily interpreted. For instance, the EF itself is incorporated as one variable within the ESI, despite marked differences between EF values and the final ESI scores (Fig. 1). Moreover, the ESI includes data such as the number of U.S. patents awarded and national investment in research and development as measures of national innovation capacity, with the assumption that high values reflect a high capacity to develop solutions to environmental problems (Esty et al. 2005). However, indices of this nature may more closely reflect economic output than environmental sustainability, leading to the observed correlation between the aggregated ESI and per capita gross domestic product.

The ESI also includes a raft of political factors such as a nation’s participation in international agreements to protect the environment and its ability to improve its environmental performance. Consequently, Morse has previously noted that the ESI is sensitive to the way in which the data are aggregated: “If sustainability is viewed in terms of capacity and global stewardship, then the richer countries do well relative to the poorer ones, while if sustainability is seen in terms of the stress placed on the environment, then the richer countries come out worst” (Morse and Fraser 2005:633). Because having the capacity to become environmentally sustainable can be quite different from actually being environmentally sustainable, measures of this nature may fail to quantify current levels of sustainability. Given such ambiguities in the ESI, we are inclined to accept the EF as a more suitable indicator of environmental sustainability for use in future cross-national analyses.

Responses to this article can be read online at:
http://www.ecologyandsociety.org/vol12/iss1/resp2/responses/

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