To the Graduate Council:

I am submitting herewith a dissertation written by Han Gyu Lheem entitled “State, Governance and Environmental Sustainability: A Cross-National Analysis.” I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirement for the degree of Doctor of Philosophy with a major in Political Science.

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State, Governance and Environmental Sustainability: A Cross-National Analysis

A Dissertation
Presented for the
Doctor of Philosophy
Degree
The University of Tennessee, Knoxville

Han Gyu Lheem
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Dedication

This dissertation is dedicated to my parents, Lheem, Byung Gi and Chun, Jin Young, for their support, encouragement and patience. I hope I have made you proud.

Abstract

Research Questions:

What determines the level of environmental sustainability in national level analyses? How can the quality of governance be defined, measured and applied in the dynamics of political processes? And, how does the quality of governance influence the level of environmental sustainability?

Model proposed and *a priori* Expectations:

Model Summary

$ES = \beta_0 + QG\beta_1 + DEM\beta_2 + EG\beta_3 + GEI\beta_4 + PG\beta_5 + \varepsilon$

a priori Expectation of Relationships

QG	+	
DEM	+	
EG	-	ES
GEI	-	
PG	-	

Where ES denotes Environmental Sustainability; QG, Quality of Governance; DEM, Level of Democracy; EG, Annual Economic Growth Rate; GEI, Global Economic Integration; and PG implies Population Growth Rate.

Methods:

The cross-national design adopted in this study attempts to investigate some of the general mechanisms of environmental sustainability and its multifaceted conditions, using bivariate descriptive statistics (correlation matrix) and multivariate analyses (OLS regression). Bivariate descriptive statistics addresses the zero-order correlations among all variables, which consist of one for all 122-sample country and six regional-economic groups, i.e. Asia, Latin America and the Caribbean, The Middle East and North Africa, Sub-Saharan Africa, East and Central Europe and the OECD (Organization for Economic Cooperation and Development) member states. And then, multivariate analyses with five independent variables are examined.

Conclusion:

Being aware of the inconclusiveness and the nature of multifaceted characteristics of environmental sustainability, this study proposes the concepts of governance, political software and political elasticity theory as a political and institutional condition for articulating the determinant of the

level of environmental sustainability and argues that the quality of national governance is intrinsically related to, and even generates pressure for, environmental sustainability.

Suggestions for Further Research:

Although the cross-national design research can provide not only a context to interpret the case studies but also hypotheses for further studies, further research should try to combine cross-national studies with longitudinal and case studies to encompass the complex and multidimensional nature of environmental studies. Moreover, endless efforts have to be put into improving conceptual and operational definitions and measurements.

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Chapter One. Introduction

Concerns with environment are the issues likely to dominate the international arena in decades to come. This is already being reflected in the proliferation of academic and popular writings, especially in the West, on environmental issues. "Think globally, act locally" is a popular slogan. Nature is a seamless global whole. The world's natural environment is intricately interwoven. A small change in a faraway place may have major consequences on the amount of our rainfall or the severity of our summer storms. Destruction of Brazilian rainforests, deforestation in Thailand or air pollution in Mexico all has worldwide consequences: global warming, a hole in the ozone layer and the destruction of biodiversity. These, in turn, affect human health and well-being across the globe. Our growing knowledge of the interconnectedness of the global environment inevitably leads to the study of environmental problems and policies in countries around the world. The complex web of interrelations among global and national governance, public policies, and environmental and socio-economic issues will require scholarly attention as the environment becomes the focus of international concern in the next century. Although the term "sustainable development" or "environmental sustainability" dates back to the 1970s, accompanied by liberal democracy and free markets, sustainable development is now a pillar of contemporary universalism, embraced from the industrialized north, to the less-developed south, to the post-communist east.[1]

The concept of global environmental change arises from concerns about the sustainability of an "earth transformed" and has led to international mandates and protocols seeking to reduce the changes in question: examples are Berlin mandate (FCCC/CP 1995); Montreal protocol (UNEP 1987); Agenda 21 (UNCED 1992); Kyoto protocol (UNFCCC 1994). It complements sustainable development by elevating issues of "sustainable" to the biosphere itself and those of "development" to humankind over the long term (Clark and Munn 1986).

The sustainability principle has been accepted at the highest levels of decision and policy making. Woven into the fabric of international agendas, it blurs the distinctions between environment and development and fosters a fusion of sustainable development and global change research. This fusion, however, creates a paradox that may be resolved not only by reframing the meaning of sustainable and, hence, the sustainability principle but also recapturing the dynamics of environmental politics.

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[1] Sustainable development became a buzzword during the United Nations Conference on Environment and Development (the "Earth Summit") in Rio in 1992. The World Commission on Environment and Development (WCED) defined the term as development that "meets the needs of the present without compromising the ability of future generations to meet their own needs" (1987, 43) and development without growth. At the time, this was a major shift in thinking about environment and development. Sustainable development has since been touted as the solution to the problems of economic development and environmental degradation. It has been adopted as a major framework for the design of programs by international aid agencies and lenders, such as the United States Agency for International Development and the World Bank. The emergence of the concept came at the same time that environmental problems were being framed as "global problems." Biodiversity loss, the greenhouse effect, and the thinning of the ozone layer are examples of such problems.

Using new sets of data on environmental sustainability and governance, this study examines critically the thesis, voiced by journalists and policymakers as well as academics, that the quality of national governance is intrinsically related to, and even generates pressure for, environmental sustainability.[2] It, specifically, asks whether (1) the process by which governments are selected, monitored, and replaced, (2) the capacity of the government to effectively formulate and implement sound policies, and (3) the respect of citizens and the state for the institutions that govern economic and social interactions among them strengthened or undermined environmental performance and sustainability. Its central premise states that better governance improves resource allocation, enhances efficiency and effectiveness, and increases the prospects for sustainability. The quality of governance functions more efficiently in environmental agendas and performances in national level analyses.

In the recent literature on environmental sustainability, lack of good governance is cited as one of the factors that either caused or contributed to the prolonged national environmental degradations. The literature also highlights the possible links between good governance, economic stability, and environmental sustainability. Greater government capacity and wider openness enable the public to make informed political decisions, improve the accountability of governments, and reduce the scope for environmental degradation.

Drawing from research and theoretical approaches, as well as assessments of original hypotheses and empirical examinations, this study suggests that environmental politics is an example of a distinction between government and governance. Governance encompasses much broader public policy considerations than assessment of government structure or location of public service production or provision. Governance integrates institutional incentives, interests, information, and relations with the public (Werlin 2000; Stillman 2001). It is, accordingly, conceptualized as an institutional framework of government: that is, traditions and institutions that determine how authority is exercised in a particular country.

In fact, this study starts with recognizing three research questions. First, what determines the level of environmental sustainability in national level analyses? Second, how can the quality of governance be defined, measured and applied in the dynamics of political processes? And third, how does the quality of governance influence the level of environmental sustainability? Examining the determinants of environmental sustainability with cross-national statistical comparisons using national aggregates from 122 countries, this study argues that the level of environmental sustainability is largely due to the degree of good governance measured by six indicators: accountability, political stability, government effectiveness, regulatory framework, rule of law and corruption control. The testing model also encompasses democracy as a social condition, growth rate as an economic function to environmentalism, globalization as an

[2] The term of governance applied here should be differentiated from global governance of neo-institutional approach in IR literature (Nye 2001; Slaughter, *et al*. 1998) and corporative governance of neo-corporatist approach (Crepaz 1992; Opschoor and Straaten 1993). The definition and scope of the governance will be discussed through the rest of this chapter.

international factor and population growth as a control variable. Table 1.1 and 1.2 summarize the proposed model and the variables.

1. Environmental Sustainability

Sustainable development, popularized by the Bruntland Commission (WCED 1987), has become the most familiar concept and objective based upon the sustainability principle (Aniansson and Svedin 1990; HMSO 1994; UNCSD 1996). What sustainable development means remains elusive, however (Lele 1991; Worster 1993). The expert literature alone is filled with numerous conflicting definitions (Adams 1990; Brady and Geets 1994; Cruz, et. al. 1996; Karshenas 1994; Munasinghe and Shearer 1995; Redclift 1993; Trzyna and Osborn 1995), within which are embedded yet more "fuzzy" concepts, for example human carrying capacity (Allan 1965; Brush 1975; Cohen 1995; House and Williams 1975). The elusive and elastic qualities of sustainable development are precisely those that resonate with a post-modern, global community. Irrespective of its inadequacies for research and practice (Redclift 1993), sustainable development that "meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1987, 43) is an ideal political formulation, providing the global community with the illusion of a broad, coherent consensus, within which an almost endless array of objectives may be pursued (Jacob 1994).

Sustainable development is challenged on many grounds: as an oxymoron (O'Riordan 1985; Paehkle 1995; Trzyna and Osborn 1995), a Western value from the political right (Lele 1991) and left (DiLorenzo 1993), or a capitalist invention diverting attention from more pressing socio-economic issues (Jacob 1994). It may also be challenged in terms of the history of human-environment relationships (Goudie 1994; Meyer 1996). The defining character of sustainable development consists of two different conceptual entities. "Development" is understood as increasing consumption, through escalating production, achieved by advancing technological control of nature (Ausubel and Langford 1997; Ausubel and Sladovich 1989; Grubler 1994). "Sustainable," in contrast, implies that the use of nature is in some sort of long-term balance with natural biogeochemical processes, including their flux. A nature so transformed that technological substitutes match or surpass nature's biogeochemistry is, by most definitions, unsustainable. In this history, "development" and "sustainable" constitute a paradox.

Giving more structure to the definition of sustainable development, it has been described as focusing on the "triple bottom line," the need to balance the three E's in the global economy: economic prosperity, environmental quality, and social equity. In other words, economic growth must be pursued in a manner that ensures the protection of both social and environmental systems. These system considerations have intergenerational and intragenerational components. In the former, future generations must be left with an ecologically viable and socially stable planet upon which to live. In the latter, present generations must be accorded an equal opportunity for economic security as well as the fair distribution of environmental costs and benefits (Farrell and Hart 1998). For this to happen, the links between

Table 1.1. An Environmental Sustainability Model proposed and *a priori* Expectations

Model Summary

$ES = \beta_0 + QG\beta_1 + DEM\beta_2 + EG\beta_3 + GEI\beta_4 + PG\beta_5 + \varepsilon$

a priori Expectation of Relationships

QG	+	
DEM	+	
EG	-	ES
GEI	-	
PG	-	

Where ES denotes Environmental Sustainability; QG, Quality of Governance; DEM, Level of Democracy; EG, Annual Economic Growth Rate; GEI, Global Economic Integration; and PG implies Population Growth Rate.

Table 1.2. Dependent and Explanatory Variables

Label	Description	Data	Sources
Dependent Variable			
ES	Environmental Sustainability	2001 Environmental Sustainable Index	2001 Environmental Sustainable Index (WYC 2001)
Explanatory Variables			
QG	The Quality of Governance	6 aggregate Governance Indicators referring to 1997-98.	Governance Matters (Kaufmann, Kraay and Zoido-Lobaton 1999)
DEM	The Level of Democracy	Freedom Index for 1999-2000.	Freedom in the World (Freedom House 2000)
EG	Economic Growth	Average rate of economic growth for 1990-1998.	World Development Report (World Bank 1999)
GEI	Globalization (Global economic Integration)	Trade share of GDP (%) in 1998.	World Development Report (World Bank 1999)
Control Variable			
PG	Population Growth	Average annual growth rate of population for 1990-1998.	World Development Report (World Bank 1999)

environmental degradation and economic activity in the developing world must be severed (Hart 1995). In short, the concept strives for a perpetually stable resource base, involving no depletion of resources or ecosystems (and possibly even an expansion of those benefits), and a perpetually stable social system, with no unfair inequities in standards of living, personal security, and income distribution.

To simplify the subject drastically, sustainable development has been defined in terms of four conditions (WCED 1987; World Bank 1992). A key assumption is that underdeveloped and economically unstable countries cannot control depredation and pollution of natural resources. Resources must be exploited as cheaply as possible and in large quantities in order to maintain socioeconomic and political order. This assumption determines four conditions for sustainable development. The first condition is that building healthy economies should be based on technologies that minimize damage to the environment. Second, given the often-observed connection between poverty and environmental degradation that drives poor people to strip resources for survival, it is crucial that attention should be paid to the basic needs of impoverished peoples with environmentally friendly approaches. Addressing these concerns generates a third condition for sustainable development. It is that environmental sustainability will provide for present generations without depleting environmental quality for future generations. The fourth condition of sustainable development is ample participation by civil society in decision-making and implementation of policies.

Despite general agreement on these broad principles, there, unfortunately, remains no clear definition of exactly how people will meet these objectives because no practical definition of sustainable development yet exists. Academics, government agencies, and activists define it in diverse and often conflicting ways. For instance, sustainable development is defined as development without growth beyond the regenerative and adsorption capacities of the environment (Daly 1996); the maintenance of environmental quality without sacrificing socio-economic development (Daly and Cobb 1993); improving the quality of human life while living within the carrying capacity of supporting ecosystems (WCU 1993); qualitative growth without increasing the total consumption of energy and materials beyond a level that is reasonably sustainable (Goodland, *et. al*. 1991).

Especially since the 1992 Earth Summit, many environmental policy objectives have been formulated in terms of sustainability.[3] The proliferation of these objectives has even spawned considerable discussion about how to measure sustainability. Yet actual conceptualizing and operationalizing the term are exceedingly rare. And nowhere are they more rare than at the national and international level where political suspicions and data gaps frequently conspire to derail even the most modest efforts to compare environmental circumstances and performances among countries.

To be useful, environmental sustainability must be conceptually defined, and an environmental sustainability index must be created in a systematic, transparent, and reproducible manner. It should be

[3] In 1992, the leaders of the world met at the Earth Summit in Rio, Brazil to set out an ambitious agenda to address the environmental, economic, and social challenges facing the international community.

faithful to the scientific literature as well as relevant to the major policy debates. It should be applicable to a wide range of situations and conditions. And it should make use of what can actually be measured today while leaving room for movement toward what ought to be measured tomorrow.

The first challenge in utilizing sustainable development is to define the scope in conceptual terms. What are we trying to measure? Unlike many efforts to think about characteristics of sustainable development, this study will focus on environmental sustainability, which is a more narrow formulation than sustainable development. This choice was made deliberately, based on a conclusion that the failure of measuring sustainability is that the efforts seek to fold too many disparate phenomena under the same conceptual umbrella. While we accept the premise that politics, economics, and social values are important factors worthy of being sustained, there is no sufficient scientific, empirical and socio-political basis for constructing metrics that combine all of them along with the environment. In fact, the environment often gets overshadowed in triple bottom line analyses and other sweeping sustainability efforts.

In this stage of the discourse, a milestone study by the World Economic Forum (WEF), the Yale University Center for Environmental Law and Policy (YCELP), and the Columbia University Center for International Earth Science Information Network (CIESIN) provides sound criteria on sustainability and focuses on the narrow term of environmental sustainability rather than the broad term of sustainable development. The formulation of conceptual and operational definition for the narrow term, environmental sustainability, used here is inspired by the collaborative work of WEF, YCELP, and CIESIN (WYC 2001).

Even having the more narrow focus of environmental sustainability, however, we are still dealing with a complicated, multi-dimensional concept. At the most basic level, following the collaborative work, this study contends that environmental sustainability can be presented as a function of five phenomena: (1) the state of the environmental systems, such as air, soil, ecosystems, and water; (2) the stresses on those systems, in the form of pollution and exploitation levels; (3) the human vulnerability to environmental change in the form of loss of food resources or exposure to environmental diseases; (4) the social and institutional capacity to cope with environmental challenges; and finally (5) the ability to respond to the demands of global stewardship by cooperating in collective efforts to conserve international environmental resources such as atmosphere. In short, while this study recognizes the well-known definition of sustainable development constructed by the 1987 Bruntland Commission of WCED, environmental sustainability is, as the dependent variable here, defined as the ability to produce high levels of performance on each of these five dimensions in a lasting manner. As seen in Table 1.3, it refers to the five dimensions as the core components of environmental sustainability.

Scientific knowledge, however, does not permit us to specify precisely what levels of performance are high enough to be truly sustainable, especially at a worldwide scale. Nor are we able to identify in advance whether any given level of performance is capable of being carried out in a lasting manner. In other words, although we can formulate the conceptual definition of environmental sustainability, we still

Table 1.3. Components and Logics of Environmental Sustainability

Component	Logic
Environmental Systems	A country is environmentally sustainable to the extent that its vital environmental systems are maintained at healthy levels, and to the extent to which levels are improving rather than deteriorating.
Reducing Environmental Stresses	A country is environmentally sustainable if the levels of anthropogenic stress are low enough to engender no demonstrable harm to its environmental systems.
Reducing Human Vulnerability	A country is environmentally sustainable to the extent that people and social systems are not vulnerable (in the way of basic needs such as health and nutrition) to environmental disturbances; becoming less vulnerable is a sign that a society is on a track to greater sustainability.
Social and Institutional Capacity	A country is environmentally sustainable to the extent that it has in place institutions and underlying social patterns of skills, attitudes and networks that foster effective responses to environmental challenges.
Global Stewardship	A country is environmentally sustainable if it cooperates with other countries to manage common environmental problems, and if it reduces negative extra-territorial environmental impacts on other countries to levels that cause no serious harm.

Source: 2001 Environmental Sustainability Index (WYC 2001, 9).

have difficulty converting the conceptual entity into a relevant, scientific, and objective one. It is our challenge to construct such an operational definition.

The Environmental Sustainability Index (ESI) composed by the collaborative work of WYC, provides excellent indicators for empirical research to address the shortcomings. These indicators were deemed the most relevant constitutive elements of the five core components and the central element of analysis. In turn, each of the indicators is associated with a number of variables that are empirically measured. After building up the complete database, WYC selected countries for inclusion in the index based on the extent of their data coverage. As seen in Table 1.4, the collaborative work generates a full set of 22 indicators for environmental sustainability (WYC 2001).

In fact, the ESI enables: (1) identification of issues where national environmental results are above or below expectations; (2) policy tracking to identify area of success or failure; (3) benchmarking of environmental performance; (4) identification of best practices; (5) investigation into interactions between environmental and economic performance; and (6) comparative studies of interactions of socio-political conditions and environmental sustainability. The ESI also permits cross-national comparisons of environmental progress in a systematic and quantitative fashion. It represents a first step towards a more analytically driven approach to environmental decision-making and environmental sustainability in the national level analyses.

Table 1.4. Components and Indicators of Environmental Sustainability

Component	Indicators		
Environmental Systems	(1) Air quality. (4) Biodiversity.	(2) Water quality. (5) Terrestrial systems.	(3) Water quantity.
Reducing Environmental Stresses	(6) Reducing air pollution. (9) Reducing waste & consumption pressures.	(7) Reducing water stress (10) Reducing population pressure.	(8) Reducing ecosystem stress.
Reducing Human Vulnerability	(11) Basic human sustenance.	(12) Environmental health.	
Social and Institutional Capacity	(13) Science/technology. (16) Private sector responsiveness. (19) Eco-efficiency.	(14) Capacity for debate. (17) Environmental information.	(15) Regulation & management. (18) Reducing public choice distortions.
Global Stewardship	(20) International commitment.	(21) Global-scale funding/participation.	(22) Protecting international commons.

Source: 2001 Environmental Sustainability Index (WYC 2001,10-11)

2. The Quality of Governance

In order to organize the argument and identify the causal relationship between the quality of governance and environmental sustainability, we require a working definition of governance *per se*.[4] Following the approach of Kaufmann, Kraay, and Zoido-Lobaton, this study defines governance as an institutional framework of government: that is, traditions and institutions that determine how authority is exercised in a particular country. This includes (1) the process by which governments are selected, held accountable, monitored, and replaced; (2) the capacity of governments to manage resources efficiently and formulate, implement, and enforce sound policies and regulations; and (3) the respect of citizens and the state for the institutions that govern economic and social interactions among them. More specifically, this study starts from the assumption that available indicators shed light on a fairly small number of broad concepts of governance, which include the following six characteristics: accountability, political stability,

[4] There does not appear to be a single accepted definition of governance in political science, especially in the field of comparative politics. The definition of governance, used here, is inspired by and formulated from the various research of the Institute for Governance, Institute for Democracy and Electoral Assistance (IDEA), the International Monetary Fund (IMF), World Bank, Kaufmann, Kraay, and Zoido-Lobaton (1999), and Werlin (1995, 2000).

government effectiveness, regulatory framework, rule of law, and corruption control.[5] Although a wide variety of cross-country indicators elucidate the various dimensions of governance, this study adopts Kaufmann, Kraay, and Zoido-Lobaton's work.[6] Their conceptual and operational definitions of governance do offer excellent guides to cross-country differences and comparisons in governance. They do not attempt to compile or present the wide array of available quantitative and descriptive data on cross-country differences in political and social institutions; instead, in order to identify important determinants of the cross-country differences in the quality of governance, their focus was limited to measuring the perceptions of interested parties such as residents of a country, entrepreneurs, foreign investors, and civil society at large, regarding the quality of governance in a country.

According to them, although this kind of data is inherently subjective, there are several reasons why it is useful in measuring governance. First, for many issues such as the prevalence of corruption, objective data is almost by definition rather difficult to obtain. There are few alternatives to subjective indicators if one wishes to measure these aspects of governance. Second, perceptions of the quality of governance may often be as important as objective differences in institutions across countries. While a country may nominally enjoy a set of sound institutions according to certain standards, the confidence of residents of a country in these institutions is also required if they are to contribute to good governance. Third, it has been proven that data based on subjective perceptions have significant explanatory power for various studies and a sound analytical basis[7] (Kaufmann, Kraay and Zoido-Lobaton 1999, 2).

Following the method of Kaufmann, Kraay, and Zoido-Lobaton, the operational measurement of governance is, here, organized by a subset of governance indicators into six clusters, seen in Table 1.5. There are two key aspects of the process by which those in authority are selected, monitored, and replaced with clusters labeled accountability and political stability. Two clusters, referred to as government effectiveness and regulatory framework, represent the capacity of the state to implement sound policies. Finally, two clusters, labeled rule of law and corruption control, capture the respect of citizens and the state for the rules that govern their interactions.

Although students in political science are suffering from a lack of literature investigating the quality of governance as an explanatory variable, economists have conducted a growing empirical survey documenting the relationship between various aspects of governance and economic outcomes. This

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[5] A series of country governance indicators was developed by the World Bank in order to foster research on the relationship between governance and development. A detailed description of these data can be found in Kaufman, Kraay, and Zoido-Lobaton (1999). While the authors of this report caution that the governance indicators carry with them large standard errors, thus limiting cross-national comparisons, they do offer reliable guides to the good and bad governance of countries.

[6] A database of such objective institutional indicators is currently being complied as a joint effort by Keefer, Bates, Epstein, and O'Halloran, in an effort coordinated by the Center for International Development at Harvard University (Kaufmann, Kraay and Zoido-Lobaton 1999, 1).

[7] For example, in the context of the 1997 East Asian financial crisis, Kaufmann, Mahrez, and Schmukler (1999) find that investor perceptions of future financial instability had significant explanatory power for future actual volatility.

Table 1.5. The Conceptual and Operational Definition of Governance and Indicators.

	Conceptual Definition
	Intuitional framework of government: traditions and institutions that determine how authority is exercised in a particular country.
	Operational Definition
(A)	The process by which governments are selected, held accountable, monitored, and replaced. Indicators measured by (1) accountability and (2) political stability.
(B)	The capacity of governments to manage resources efficiently and formulate, implement, and enforce sound policies and regulations. Indicators measured by (3) government effectiveness and (4) regulatory framework.
(C)	The respect of citizens and the state for the institutions that govern economic and social interactions among them. Indicators measured by (5) rule of law and (6) corruption control.

Source: Governance Matters (Kaufmann, Kraay and Zoido-Lobaton 1999)

literature includes Mauro (1995) on the effects of corruption on economic growth and investment; Loayza (1996) on the determinants of the unofficial economy; Ades and DiTella (1996) on the causes and consequences of corruption; Knack and Keefer (1997) on the importance of institutions for economic growth; Tanzi and Davoodi (1997) on corruption and public investment; Wei (1997) on the effects of corruption on foreign direct investment; Rodrik (1997) on the role of institutions in the success of East Asia; Johnson, Kaufmann and Zoido-Lobaton (1998) on the effects of corruption on the unofficial economy; Hall and Jones (1999) on the relationship between levels of per capita income and a measure of what they call, social infrastructure; and Chong and Calderon (1999) on the Granger-causality between institutions and economic growth. It is, accordingly, worthwhile for students of politics to examine and emphasize what governance is in terms of conceptual formulation as well as practical application, and how good governance acts in various political processes. Using the six aggregate governance indicators described above and constructing a model of environmental sustainability, this study contributes to the literature of environmental politics by examining a causal relationship from improved governance to better environmental sustainability.

3. Democracy and Economic Development

In popular thinking democracy is friendly to, and sometimes even necessary for, the protection of the environment. Political democracy allows citizens to influence public policy by participating, individually and collectively through interest groups, in their formulation and implementation. Fair periodic elections, freedom of speech, assembly and organization, and generally free press seem essential for citizen's ability to influence their government and keep it accountable. The vast scale of environmental

destruction in the ex-communist countries of East and Central Europe and the old Soviet Union has strengthened the idea that democracy is better able to protect the environment than authoritarian regimes (Albrecht 1987; Alcamo 1992; Bolan 1992; Feffer 1992; Singleton 1987; Ziegler 1987). The lack of freedom for citizens to openly organize and oppose environmental destruction in the ex-communist countries has been considered a major reason for this unchecked destruction. The lack of political rights and civil liberties in these countries contributed significantly to the lack of environmental protection (Debardeleben 1991; Jancar-Webster 1993; Singleton 1987). Protests against environmental destruction became an important part of the general opposition to the communist regimes in East and Central Europe that eventually resulted in their collapse (Jancar-Webster 1993).

Non-communist authoritarian regimes seem to be equally unfriendly to the environment (Desai and Snavely 1998). In Nigeria and Indonesia the military dictatorships have paid little attention to the vast environmental destruction in their drive to exploit resources: oil and forests.[8] Lack of openness and lack of information about the government policies along with lack of freedom of speech and organization in authoritarian regimes make it very difficult to deal effectively with the problems of environmental pollution and destruction. Political democracy, with its freedoms and its openness and free flow of information, seems better designed and more likely to deal effectively with environmental problems.[9]

Democracy itself seems to be at least partly dependent on the level of a country's economic development. Lipset argued that democracy is related to the state of economic development. The more well-to-do a nation-state, the greater the chances that it will sustain democracy (Lipset 1960: 31; Diamond, Linz, and Lipset 1989). The studies over the last four decades seem generally to support the causal relationship between economic development and democracy (Diamond 1992). As sustaining democracy is dependent on economic development, and since economic growth and prosperity generally result in environmental pollution and ecological destruction, democracy would not necessarily be protective of the environment. Freedoms associated with democracy perhaps provide a better potential for environmental protection, if and only if protection of the global environment becomes a highly desired value over a long and sustained period of time, for a large majority of the people. However, democracy's dependence on economic development means that for democracies to be friendly to the environment would require fundamental changes in the individual values and the dominant social paradigm that justify ever increasing material wealth and prosperity even at the expense of the environment (Desai 1993; Inglehart 1997). The

[8] The recent hanging of a Nigerian poet and playwright, Ken Saro-Wiwa, and eight other members of his Ogoni tribe underlined among other things the dangers of protest against environmental destruction in a military dictatorship.

[9] The connection between political democracy and environmental protection appears less compelling when focus is on the rich industrial countries. Environmental pollution and ecological destruction have reached very high levels in the Western democracies. Most of the greenhouse gasses responsible for global warming, most of the chemicals responsible for the hole in the ozone layer, and most of the hazardous and toxic wastes are produced by the democratic industrial countries.

historical record of ecological destruction in democracies does not inspire much confidence in their ability to protect the environment.

Notwithstanding the current popularity of the market as a solution for all social problems, much of the argument for the environmental regulations enacted over the last twenty-five years in market democracies is based on the need for government action to counter the limitations inherent in the working of the market (Hardin 1968; Hodge 1995; Tietenberg 1992). Problems of environmental pollution and destruction are, in neoclassical economics, a result of a market failure (Samuelson 1983). In economic theory, environmental pollution in a market economy is a problem of externality, a result of the fact that not all the costs and benefits of the use of environment are reflected in market transactions (Hodge 1995; Andersen 1994). However, continued environmental pollution and ecological destruction in spite of environmental regulations have in recent years brought increasing attention to the failure of government regulations to protect the environment. Many explanations have been advanced for continuing ecological destruction and for inability of environmental regulations to stop it. Some environmentalists blame it on the continuing dominance of belief in perpetual economic growth and unchecked industrial expansion (Rogers 1994; Sachs 1992; Tokar 1987). However, believers in the superiority of the market have blamed it on the self-interested behavior of bureaucrats and the inherent inefficiency of administrative regulations (LeGrand 1991; Wilson 1980; Niskanen 1971). They argue that government regulations are not only ineffective and inefficient, but are also counterproductive. They believe that more extensive property rights to natural resources (including the natural environment) would protect more efficiently the environment people want to protect. They advocate "free market environmentalism" instead of environmental regulation (Andersen and Leal 1991).

Many of those between the true believers in the magic of an unfettered market and those who completely reject the market and the modern industrial order attribute the continuing environmental degradation both to market failure and to state failure (Janicke 1990; Cairncross 1994). Many policy makers and academics, especially economists and political scientists, have increasingly advocated use of the "polluter pays" principle through market mechanisms such as green taxes and levies as effective ways of dealing with market failure to protect the environment (Andersen 1994; Barde 1994; Baptist 1994; Mitnick 1980; Marcus 1982). While there have been relatively few empirical studies of the effectiveness of these economic instruments (Andersen 1994; Hidefumi 1990; OECD 1989; Hudson, Lake, and Grossman 1981), there is increasing evidence that such economic instruments produce more mixed results than economic-rationale predict (Andersen 1994; OECD 1989; Majone 1989). Market-based instruments have serious limitations in protecting the environment in practice. Their effectiveness depends on the institutional setting, including national policy style (Andersen 1994).

The willingness and capacity of governments in poor countries to enforce environmental policies and regulations are often questionable. Corruption among politicians as well as bureaucrats is widespread in many poor countries. Polluting industries and businesses fend off and ignore environmental regulations

by routinely bribing or buying off government officials. In poor countries, there is often a general lack of scientific knowledge about the environment in the very agencies that are entrusted with protecting it. These agencies also often lack the professionalism, independence, and resources necessary to effectively enforce the regulations. In addition, the centralized nature of environmental protection agencies and policies reduce the government's capacity to control pollution and protect the environment. Some environmentalists and scholars suggest that grass-roots community and nongovernmental organizations provide a more effective alternative to government agencies in protecting the environment and in using natural resources wisely (Reilly 1993; Ostrom 1990; Ostrom, Schroder, and Wynne 1993).

4 Organization of the Study

This study is to examine the determinants of environmental sustainability with cross-national statistical comparisons using national aggregates in 122 countries. It hypothesizes and tests the thesis that the quality of governance is intrinsically related to, and even generates pressure for, environmental sustainability. Although a wide variety of research has tried to construct a general theory for environmentalism, inconclusive findings about the dynamics of environmental politics have still emerged in the literature. Based upon the inconsistencies of existing theories and previous comparative research on environmental sustainability, this study constructs a critical test of original hypotheses and analyzes multifaceted dynamics of environmentalism. Chapter one explores the problem and challenges of different degree of environmental sustainability and identifies conceptually and operationally the two main variables, environmental sustainability and governance, in order to enhance the clarity of the presentation. It also explains the interconnectedness of democracy, economic growth and the environment. Chapter two examines theoretical orientations, focusing on various arguments and determinants of good governance. Recognizing the multi-dimensional complexity of environmental politics, this chapter elaborates political elasticity theory to ground the proposed thesis: the better the governance, the better the environmental sustainability. The main assumption of political elasticity theory says: "the more governments or those in authority can integrate and alternate soft forms of political power (e.g., incentives to persuasion) with hard forms of power (e.g., disincentives and coercion), the more effective they will be" (Werlin 2000, 582). Chapter three delineates the impacts of democratic, economic, and international factors on the environment. They include (1) the function of democracy and civil liberties as social conditions, (2) the economic impact of growth on environmentalism, and (3) the consequences of global economic integration and UN environmental conferences as international factors. Chapter four consists of a discussion of the data and method used. It constructs an environmental sustainability model and investigates empirical surveys of multiple regression analyses. This model identifies the causal relationship between explanatory variables and the dependent variable, environmental sustainability. Chapter five presents findings and discussions. The empirical results elaborate and confirm the main proposition that environmental sustainability is largely due to the degree of governance quality. And more, the dynamics of regional environmental politics

will be presented.[10] Last, summarizing findings and their implications, Chapter six offers brief concluding observations on both theory and future of environmental politics and suggests some guides to further research of governance and environmental sustainability.

[10] Along with testing the general hypotheses (sampled in all 122 target countries), reduced hypotheses are also analyzed in the basis of six regions: Asia; Latin America and the Caribbean; Middle East and North Africa; Sub-Saharan Africa; East and Central Europe; and the OECD member states. Countries in the six groups are not necessarily mutually exclusive. For more details, see the section of Sample Selection in chapter four.

Chapter Two. A Comparative Perspective of Governance

This chapter will investigate theoretical foundations of governance, its relevance and implications. Let us look at the following comparative questions: What explains the capacity of countries to perform both environmental sustainability and economic development?[11] What explains the different degrees of environmental sustainability among countries and/or among similar types of regimes (i.e., democratic, authoritarian, and totalitarian)? Why is economic globalization good for environmental sustainability for some countries, but not for others? Then, there are more general comparative questions: What explains the capacity of countries to change their political culture? Why is it that autocratic governments are sometimes more effective in promoting development than their more democratic counterparts? Why is it that More Developed Countries (MDCs) are both more centralized and more decentralized than Less Developed Countries (LDCs)? Why is it that corruption is devastating for poor countries, but not rich countries?

One group of students in political science might begin their answers with a description of political systems (authoritarian, totalitarian, democratic, single-party, multiparty, parliamentarian, presidential, federal, military, etc.); another would introduce a variety of concepts (conflict, choice, structure, function, leadership, culture, participation, attitudes, values, processes, opinions, rationality, etc.). I believe the students in both groups would fail to provide satisfactory answers because they would neglect the nature of governance.[12]

While the students might discuss the selection of leaders (who governs?) and policies (rational choice or cognitive frame)[13] they would tend to ignore issues like the quality of governance and the implementation of policies. Specifically, the issues are (1) the *process* by which governments are selected, monitored, and replaced, (2) the *capacity* of the government to effectively formulate and implement sound policies, and (3) the respect of citizens and the state for the institutions that govern economic and social *interactions* among them.

In this chapter, we will discuss conceptual discourses of governance and introduce the notions of political elasticity and software. And then, I will show how political elasticity theory explains the differences of governance quality among countries. Finally, I will survey and delineate comparative analyses of governance on national levels and summarize the chapter.

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[11] Economic development should be differentiated from economic growth, although two terms are often interchangeable in both economic and economics-oriented environmental studies literature. Economic development, here, implies "increased human welfare without increased use of materials or waste," while economic growth denotes "increased use of materials and waste" referring to expanding economic scale and the monetary value of output (Daly 1995).

[12] Following the works of Werlin (1998), Kaufmann, Kraay, and Zoido-Lobaton (1999), Newland (2000), and Pei (2002), this study conceptualizes governance as an institutional framework of government: that is, traditions and institutions that determine how authority is exercised in a particular country. (see table 1.5 in Chapter one).

[13] Influenced by psychological studies, prospect theory in IR literature is the most significant policy formula in cognitive frame (Berejikian 1997, Berejikian and Dryzek 2000).

1. Conceptual Discourses

Although students in political science are suffering from lack of literature investigating the quality of governance as an explanatory variable, economists have conducted a growing empirical survey documenting the relationship between various aspects of governance and economic performances.

Comparative political studies fail to consider governance research for two reasons. First, conceptualizing and quantifying the objects of governance are difficult. Although the concept of governance has become pervasive in social sciences over the past two decades, its meanings adapt to context and purposes, just as chameleons change according to their surroundings. Flexibility and ambiguity are part of its virtues. The concept of governance, however, has proved useful in dealing with the complexities of the exercise of authority in societies (CGG 1995; Casaburi et al 2000). A body of literature has attempted to circumscribe the uses of the term and define more precisely its meaning (UNESCO 1998; Werlin 1998; Kaufmann, Kraay, and Zoido-Lobaton 1999, Stillman 2001). From this literature, we are able to identify a common ground among the different uses of the term. It refers to situations in which several actors play different roles to achieve a given goal in a context where power is legitimately exercised with the endowment of public consensus. This implies that the exercise of power and authority lies not only in objective forms of government such as regime types, governmental regulations and procedures but also in subjective relationships between government and the citizens. In this respect, an objective form of governmental functions and interrelational functions of government to the public are both important. Consequently, governance can be conceptualized and operationalized by understanding the fundamental nature of politics,[14] including objective functions of government, here named political hardware, and subjective functions of government, called political software (Wolin 1960; Werlin 2000).[15]

Second, many view governance as a technical subject without political significance and linkage. However, for encompassing nonstate actors such as firms, business associations, Non-Governmental Organizations (NGOs) and advocacy groups, good governance deals effectively with complex public policy issues in which a two-way flow of communications between government and its social spheres in decision-making processes is guaranteed. A wider role of civil society organized by local and functional organizations should help public policy overcome the lack of legitimacy and representation of many governments in LDCs. In this more general use, governance involves building consensus and obtaining the acquiescence necessary to carry out a program in an arena where many different interests are in play (Alcantara 1998). Furthermore, the more recent questioning of the effective capacities of traditional state

[14] According to Wolin (1960), politics can be understood from two angles: partisanship politics and statesmanship politics. The former is about the "struggle for competitive advantage," while the latter connotes the "struggle for consensus" in the interactions with the public (Wolin 1960, 434; Werlin 2000).
[15] Political hardware and software will be more explicitly defined later in this chapter.

structures to fulfill their obligations and achieve their goals enables a smooth transition of the use of the term governance not only in cross-national comparative studies but also in the global agenda.[16]

Consequently, the notion of governance addresses issues of power distribution and political consensus that allow the easing of political conflicts and tensions in a nonideological fashion.[17] Good governance includes much broader public policy considerations than assessment of government structure or location of public service production or provision. Good governance integrates institutional incentives, interests and information with citizens' involvement in political processes.

Despite the conceptual complexities of governance, Multilateral Development Banks (MDBs) such as the World Bank and the Inter-American Development Bank (IDB) have incorporated the notion of good governance into their lending programs.[18] Good governance has become acknowledged as being for the benefit of the subjects that are governed.[19] In a notable deviation from its traditional support of neoclassical economic frameworks for economic development in the Third World, the World Bank argues that state capability in promoting efficient collective actions ensuring the maintenance of law and order, public health and basic infrastructure is essential for development. The Bank implies that state capability means combating entrenched corruption, subjecting state institutions to greater competition, making the state more responsive to people's needs and bringing government closer to the people through broader participation and decentralization of government activities (Tussie and Fernanda 1997).

Accordingly, the notion of good governance serves as the main criterion to measure state capacity in comparative research. The Bank uses a definition of governance that turns it into a problem-solving tool

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[16] In fact, the concept of governance has been applied to different units of analysis: an industry, an issue area, an international regime, or a country. Analyzing governance on the national level is often seen when international development institutions refer to conditionality of international loans and aid. It is said; "improving governance in borrowers" is the main criterion for international aid programs (World Bank 1994, 2000).

[17] Although this feature has contributed to its rapid acceptance, the concept curiously has no Spanish equivalent. The Latin American political tradition tends to consider the formal and objective forms of government as the epicenter of all struggles and processes (Stillman 2001, 250).

[18] International lending programs in Latin American states illustrate a good example. Political consensus among governments and international communities led the IDB to suspend consideration of loans to Allende's Chile in the early 1970s and to the Sandinista government in Nicaragua in the 1980s. On the other hand, Chile under Pinochet after Allende's regime was considered as one of the most favored countries in the region, although the regime was anti-democratic and severely authoritarian. In the 1990s, with a new consensus on democratic governance rule after the fall of President Aristide in Haiti, the IDB suspended all further country planning. When President Fujimori suspended constitutional rule in Peru in April 1992, the IDB's board blocked all new loans to the country, and management froze the signature of loans already approved by the board. The block was lifted when a new plan of governmental reform was announced in September, and the Bank subsequently led an international rescue package for Peru (Tussie 1995).

[19] Although MDBs intend to play within the limits of the so-called technical understanding of governance, they also expect to achieve results coherent with a wider definition of governance: better governments that are more transparent, more honest, and more representative of the popular will. In this wider sense, we can see the roles of the MDBs in the last decade at three different levels of governance: global, local (borrowing countries), and their own institutional governance.

to make projects more effective or to help borrowing countries use scarce resources better to move along the development path. Thus governance is the manner in which power is exercised in the management of a country's economic and social resources for development (Laateef, 1992; Murphy 1994). In this way, governance becomes a process of political compromising and a set of conditions that facilitates not only economic development but also socio-political development. This process and these conditions are consistent with the original mandates of the World Bank and, in principle, stripped of political significance (Boeningher 1992). Good governance is, consequently, a political manifesto about efficiency and effectiveness of public policies and governmental capacity (Werlin 1998; 2000; Stillman 2001).

Analyzing comparative political systems, Pei articulates the notion of governance in the context of regime changes. According to him, there are three fundamental functions of governance (Pei 1998; 2002, 97-99). In most political systems a regime's capacity to govern is measured by how it performs three key tasks: managing internal tensions, providing public good, and mobilizing political support. These three functions of governance, named as conflict resolution, performance, and legitimation, are, in reality, intertwined. A regime capable of providing adequate public goods such as education, public health, law and order, is more likely to gain popular support and keep internal tensions low. Strong organizational discipline, accountability, and a set of core values with broad appeal are essential to effective governance. Unlike MDBs' institutional approach to defining governance where societal conditions and public participations are key explanatory variables, this statist approach relies on the condition that a regimes' willingness and capability are essential for constructing a good governance.

In a context of public service in a globalized world, Newland (2000) illustrates three interrelated notions of governance: facilitation of collective actions by public institutions (*capacities*), public values-oriented social self-governance where individuals and communities organize to express and pursue their collective values and priorities (*socio-political processes*), and reliance on the disciplines of market systems and civil society (*interactions*).[20] All this occurs in a context of the exacerbation of global trends in economic and financial, technological, environmental, and socio-political areas (Brinderhoff and Coston 1999; Farazmand 1999).

In this stage of debates, Kaufmann, Kraay, and Zoido-Lobaton's research shows not only a conceptual stretch but also an operational articulation in the study of governance. Including the

[20] De Tocqueville identifies civil society with the premodern trans-class network of mutual aid and social service rooted in local villages and neighborhoods. He employs the notion of "political association" in order to capture the new dimension of social life characterized by autonomous groups able to articulate and to defend their needs and interests through public discussion and other forms of collective action (Tocqueville 1848 1969, 189-95). The notion of political association resembles Diamond's definition of civil society as "the realm of organized social life that is voluntary ... [and] autonomous from the state" in which "citizens act to express and defend their ideas, interests, and needs" (Diamond 1994, 5). The difference between these concepts stems from the nature of the mediating function each performs. While the Tocquevillian notion of political association implies mediation between the traditional network of mutual support and the state, the contemporary notion of civil society, posited in the horizontal parallelism with political society, connotes mediation between the private lives of individuals and the state.

perspectives of diverse observers (political experts, businesses, and private citizens) and covering a wide range of topics (political stability and the business climate, the efficacy of public service provision, experiences with corruption, and so on), they defines governance as "an institutional framework of government" and identity three attributes to governance: *political process*, *government capacity*, and *interrelationships* between government and the citizens (Kaufmann, Kraay, and Zoido-Lobaton (1999, 1). More specifically, assuming that available indicators shed light on a fairly small number of broad concepts of governance, they operationalize governance with the following six characteristics: accountability, political stability, government effectiveness, regulatory framework, rule of law, and corruption control. Their conceptual and operational interpretations of governance do offer excellent guides to cross-country differences and comparisons in governance. In keeping with the emphasis on the facilitative state, according to them the concept of governance can be a favored solution for exploring ways to improve the efficiency, effectiveness, and feasibility of public services.

Good governance, accordingly, offers significant potential to (1) enhance efficiency and effectiveness by relying on comparative advantages and a rational division of labor; (2) provide the multiactor, integrated solutions sometimes required by the scope and nature of the problems being addressed; (3) move from a no-win situation among multiple actors to a compromise and potential win-win situation in response to collective action problems or the need for conflict resolution;[21] and (4) open decision-making processes to promote a broader operationalization of the public good (Brinderhoff 2002, 325).

In sum, although there are virtually innumerable definitions of governance among practitioners and political scientists, governance conceptually defined as an institutional arrangement with six quantifying indicators shows positive heuristic characteristics in research programming. The concept of governance encompasses much broader public policy considerations than assessment of government structure or location of public service production or provision. Table 2.1 shows a wide variety of notions of governance and its attributes. We turn now to considerations of political elasticity and software.

[21] The evolution of collective-action theories reflects an increasing acknowledgment of its complexities. Originally, it was assumed that individual actors would rationally choose to engage in collective action because of their acknowledged interest in doing so. From the individual perspective, this constitutes self-interest. In the organizational context, this can be viewed as instrumental rationality (Machado and Bums 1998). The organization will participate in collective action if it presents an opportunity to further its own objectives. Because there are opportunities to free ride, collective action may actually be irrational and, therefore, incentives and sanctions must be created to ensure compliance with collective-action objectives (Olson 1965). More recently, scholars have begun to recognize that utility and rationality can also be based on moral grounds (Etzioni 1991, 1988; Frank 1990).

Table 2.1. Comparing Notions of Governance and Its Attributes

	Cluster (Function)	Attribute (Operational Indicator)
Governance in Political Elasticity Theory	Hybrid Aspect	Accountability
	Administrative Function	Effectiveness
		Efficiency
	Political Feature	Citizen Participation
		Transparency
Governance in Pei's Study	Conflict Resolution	Managing Internal Tension
	Performance	Providing Public Goods
	Legitimation	Mobilizing Political Support
Governance in This Study	Processes	Accountability
		Political Stability
	Capacities	Government Effectiveness
		Regulatory Framework
	Interactions	Rule of Law
		Corruption Control

2. Political Elasticity Theory and Political Software

Permitting equal consideration of political science and public administration, Werlin implants "political elasticity" as a theory of governance. The principles of political elasticity theory are employed to answer not only comparative political questions but also general political science research (2000, 582-3).[22] According to Werlin, political elasticity theory consists of the following five propositions: First, the more governments or those in authority can integrate and alternate soft forms of political power, linking incentives to persuasion, with hard forms of power, including disincentives and coercion, the more effective they will be. Second, as leaders integrate and alternate soft and hard forms of power, their political power takes on "rubber band" and "balloon" characteristics,[23] allowing them (1) to decentralize or delegate power in various ways without losing control and (2) to expand their influence, reliably and predictably affecting the behavior of wider circles of citizens, participants, and subordinates. Third, political elasticity depends partly on the selection of appropriate political hardware, including "objective" forms of organization, but mostly on political software, recognizing the "subjective" quality of relationships between a government and its citizens. In other words, political software articulates the interrelationships between leaders and followers, while political hardware implies an "objective" form of organization, regulation, procedure, and technology. In this demarcation, what is as important as "the determination of rational choice" is "the implementation of rational choice," and this inevitably brings us into "politics" in its classical meaning: "the relationship of leadership to followership for the purpose of

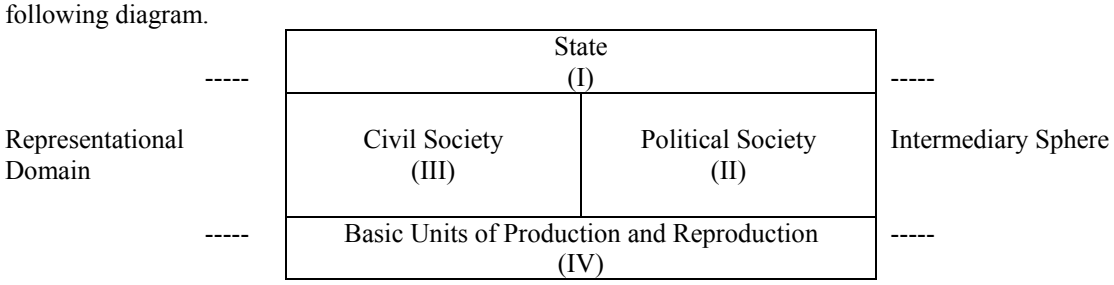
[22] We have seen the sample comparative questions in the beginning of this chapter.
[23] These characteristics can be compared with the Lakatosian notion of a "protective belt" of auxiliary hypotheses where adjustments are made in the face of anomalies (Lakatos 1970).

governance" (Werlin 2000, 439-42). Fourth, political software can be made more effective in the commonsensical ways suggested by typical public administration and business administration studies. They include establishing acceptable goals, hiring qualified personnel, delegating responsibility, stimulating motivation and competition, encouraging training, paying attention to morale, expanding two-way flows of communication, promoting legitimacy, maintaining supervision, protecting independent spheres of authority, cultivating contractors, and developing conflict-resolution procedures. These steps are increasingly referred to as "good governance." Last, the enhancement of political software requires a balancing of the two meanings of political power identified by Wolin (1960, 10-11, 434): the struggle for competitive advantage (partisanship) and the struggle for consensus (statesmanship). This demarcation is derived from Wolin's definition of politics understood with three venues: partisanship, statesmanship and governance. This makes it possible to distinguish primary and secondary democracy and primary and secondary corruption (Sartori 1962; Wolin 1960). Whereas primary democracy has to do with elections, multiparty systems, and majority rule (i.e., when there is a meaningful struggle for competitive advantage), secondary democracy refers to the consensus-building essential for successfully managing the competition. Primary corruption, accordingly, denotes excessive partisanship or greed, while secondary corruption indicates a governmental inability to control or mitigate this situation.[24]

These assumptions depart from two theoretical foundations. The first is Weberian theory, partly because of Weber's mechanistic conception of hierarchy, qualifications, responsibilities, and privileges, but more because of his idealization of impersonal rationality, with expertise and rules, rather than humans, being in control (Chung, Shepard, and Dollinger 1989). For Werlin, politics is essential for administration, whereas, for Weber, depoliticizing administration (in which bureaucracy is built as a political formation frequently referring to the "system of social domination") is essential (Harmon and Mayer 1986, 310). The difference between Weber's and Werlin's theories stems from the multidimensional conception of politics, linking politics to consensus-building, rather than limiting its meaning to maximizing personal or partisan advantage. Consequently, complex relationships between political and other social spheres[25] must be

[24] As an analogy, we might think of basketball fouling under two situations: one in which there is normal refereeing, so that "fouling is meaningful, punishable, and tolerable"; the other in which refereeing is corrupt, "causing fouling to be pervasive, essential, and destigmatized" (Werlin 2000, 451).

[25] An analytical frame for the interrelationships among various societal spheres can be found in the following diagram.



In this interrelational dynamics, good governance should function in all four dimensions. According to Diamond, civil society is the autonomous and voluntary realm where citizens act to express and defend

developed to improve administrative governance, whereas Weber, except in his ambiguous use of the word, "legitimacy," would consider such relationships dangerous and, thus, to be suppressed. In Weber's theory, we can see a vicious circle emerging, with leaders increasingly fearful of delegating responsibility, more reliant on coercive and corrupt forms of power, and less certain of cooperation. This explains why the so-called "predatory regimes," while powerful enough to be highly repressive, are not powerful enough to promote development. Indeed, they are also likely to be uninterested in various forms of development.

The second theoretical foundation is Easton's concept of political community and authority. Easton delineates boundaries of political community, which include both persons in government and persons outside of government, as they provide demands (lobbying, advocacy, etc.) and supports (loyalty, compliance) that energize and sustain the political system and its function. The "units of political system" are "political actions as they structure themselves in political roles and political groups," according to "at least some minimal division of labor" (Easton 1957, 386-7). Hence, the political system and social spheres are interdependent, and both construct the political community, which is more than merely the political system or governing institutions within the system understood as political hardware in this study, while political community is based on the flow of two-communication (input and feedback) between citizens and government conceptualized as political software here. From this perspective, and in our conception of political software, the political community of a given territory is the collection and dialogue of citizens in and out of government who recognize the government as the legitimate decision maker for that territory, generally comply with its decisions, and cooperate toward shared purposes.[26] Embedded within the community is the political system: the interacting set of private associations and governmental institutions involved in the decision-making process for the society that forms the political community (Easton 1957; 1965).

Furthermore, political elasticity theory can bridge a quantitative approach to a qualitative one, getting closer to "triangularity" fashion (King, Keohane and Verba 1994; 1995, 479; Tarrow 1995). Subjective processes of interrelations with citizens give a necessary counterbalance to the political hardware perspective that aims at objectivity, consuming so much of political science research. It can sensitize us to "the value problems" or governing, interrelational and cultural issues that may often seem invisible in the background simply because it is hard to be quantified, but are no less critical to making sound process of public policy. As an individual moves up the bureaucratic hierarchy, one must navigate through increasingly complex "competing ethical codes" (Barnard 1938, 272). In this vein, Werlin

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their ideas, interests, and needs, whereas political society represents political parties and other organizations whose formal goals are to seize state power. Hence, it functions as an intermediary between civil society and the state (Kim 1996; Diamond 1994, 4-5) and is embedded with political community, conceptualized as the interrelationships and "collection of persons in and out of government" (Easton 1957, 386).

[26] In this respect, political communities are also conceived by Deutsch as "social groups with a process of political communication, some machinery for enforcement, and some popular habits of compliance" (Deutsch 1954; 1970, 5).

introduces political elasticity theory as a unified theory in two ways: (1) reconciling contradictory theories between behavioralists and post-positivists and (2) presenting a single direction for political development, regardless of culture or form of government. Whether or not Werlin succeeds at making a convincing case for his theory of political elasticity, he demonstrates how political processes, government capacity, and interactions with citizens can be mixed, analyzed, and then judiciously related to seminal academic issues of our time for theory building as well as problem solving. He also suggests that the quality of relationship and values should be "imposed," emphasizing the importance of alternating and blending persuasive forms of power and coercive forms of power, understood here as political software and hardware, respectively. Werlin draws together an impressive swath of theoretical research and practical firsthand observations to synthesize and advance a political elasticity theory or political software that emphasizes what works has to do more with "subjective factors" than "objective ones" (Stillman 2001, 248). Let us now turn to specific cases illustrative of the above theories of governance.

3 Comparative Analyses of Governance: Cases of Environmental Management

We begin by considerations how governance functions differently in environmental management with two extreme cases, Japanese and Nigerian governances. While I believe that the comparison of governance in Japan and Nigeria illustrates the difficulty of generalizing what and how governance is from a MDC to a LDC, these two extreme cases can explicitly articulate the functions of political software and the quality of governance. All in all, Japanese political software tends to be extremely strong, and three components of good governance - processes, capacities, and interactions - are very elastic. On the other hand, in Nigeria, political software tends to be extremely weak. That is why Nigeria, in particular, and most of sub-Saharan African states in general, appears to the outsider so confusing, characterized simultaneously as "overdeveloped" and "underdeveloped" or "soft" and also "authoritarian" (Callaghy 1994, 200, 202).

Nature of Bureaucracy

The meritocratic nature of the Japanese bureaucracy is obviously an important explanatory factor in the success of Japanese sustainable development.[27] While Japan's public sector is relatively small,[28] it attracts the best educated. In 1982, there were more than 40 applicants for each position; and in 1988, only 6.3% of those taking the higher civil service examinations passed (Pempel 1982, 269; Koh 1989, 80). It

[27] Analyzing comparative environmental management, Kenney and Florida (1993) articulate the Japanese environment management model with a number of aspects: careful selection of public servants, self-management work teams, job rotation, overlapping functions, flexible and limited job classification and specialization, employment commitment and job security, close alignment between work and home life, social control rather than control from above, social reinforcement of norms and practices, use of persuasion rather than commands, good community relations, welfare corporatism, single cafeterias, labor-management cooperation, quality circles, innovation from below, perpetual innovation and continual training.

[28] Japanese public sector figures 4.4 employees per 100 inhabitants, which is one-third the figure for Great Britain and just over half for the U.S.A. and Germany (Werlin 1995, 127).

should also be noted that most of these applicants come from Japan's top universities, which are notoriously difficult to get into. Although its small size compared with most other nations and its stringent processes of selection, the elitism of the Japanese bureaucracy has aroused public animosity as well as admiration. In Nigeria, in contrast to Japan, there has been an intensification of mistrust within the Nigerian political system since independence. According to Williams (1992, 114), "much of the acrimony among elites is attributable to intemporate personality conflicts and quarrels dating back to the First Republic." Positions in public administration are seen primarily as opportunities for private enrichment (Koehn 1990, 274). Thus, politics is nothing more than a way of distributing public patronage in appointments and expenditures (Forrest 1993, 7).

Capacity: Effectiveness and Regulatory Framework

Respect for Japan's central government bureaucracy is essential in explaining the success of environmental management program because of its systematic regulatory framework. Most environmental regulations and policies including anti-pollution initiatives are primarily developed by the Japan Environment Agency in consultation with the Ministry of International Trade and Industry (MITI) and other competent authorities (MEIP 1994, 43). Eventually these initiatives must be approved by the Central Pollution Control Council, which consists of representatives from academia, industry, public interest groups, and local government, prior to submission to the Diet. MITI plays a central role in all this, using its Industrial Technology Institute to facilitate negotiations over standards, financing mechanisms, and technology development. Japan's capacity for implementing public policies has to do with the political elasticity of its administrative system. Experts on Japan describe how political elasticity and software function in different ways. MacDougall writes: "Japanese-style democracy … emphasizes equality in human welfare as well as in participation" (1989, 155). Keehn (1990, 1034) notes an informal exchange mechanism within the bureaucracy that "is intended to balance institutional interests and maintain avenues of information exchange, negotiation, and compromise between powerful ministerial actors and clients." Koh (1989, 256) refers to the consensus-building devices of *ringisho* and *nemawashi*, by which the administrative elite undertake "a painstaking process of touching bases with all important persons who probably will impinge upon a decision." This is not to deny the Japanese ability to use coercion and sanction; but, as Haley (1991, 191) points out: "They must be recognized as fair," adding: "For all the conflict, inefficiency, and dysfunction manifested in so many aspects of postwar Japanese social, political and economic life, Japan maintains a remarkably just as well as stable social order."

On the other hand, Phillips (1991) delineates the following five deep-rooted political and administrative weaknesses in Nigeria. The first issue is lack of measurable objectives. Because most Nigerian agencies lack clear and measurable objectives, administrators must work within an environment of consistent instability. Long term planning, therefore, becomes impossible. The second is the process of inadequate evaluations. Nigeria operates a political culture that places no premium on performance or

achievement. Since access to governmental power has come through the barrel of a gun or through rigged elections, those in power are not motivated to provide good public services and are unable to compel the civil service to do so. Although annual performance evaluation forms were introduced in 1975, little use is made of them, with across-the-board automatic annual salary increments defeating the purpose of rewarding achievement. The third problem is mismanagement of time. The emphasis of the Nigerian civil service is largely on form, strict hierarchy, and subservient obedience to superiors, not on time-management. With numerous links in the bureaucratic chain and excessive caution in the processing of decisions, the public can expect long delays even on trivial matters. To speed up the process, the public is encouraged to make illegal payments. The fourth is a disorganizational function. The internal structure of most ministries is confusing. Consequently, there is little control over what goes on and much conflict between professional and administrative personnel. What has contributed to the confusion is the conflict among the Ministry of Finance, the Central Bank, and the Ministry of National Planning, resulting in serious deficiencies in data collection, information management, coordination of agencies, and decision-making. The last is about personnel Mismanagement. Because the Federal Civil Service Commission consists of nearly illiterate political cronies of the president, members lack the knowledge, experience, and reputation to command the respect of civil servants. Staff is wasted, with too few qualified personnel hired and retained at the top levels and excessive reliance on underpaid and untrained clerical cadres for routine operations and contact with the public. Little formal training exists, and it tends to be sporadic, poorly funded, and at the whim of departmental heads or permanent secretaries. Those who are trained have no guarantee that their training will be respected or used, particularly in as much as they are frequently shifted among ministries.

Nigerian officials rely far more on coercion than their Japanese counterparts. For example, the military government in 1984 declared “War Against Indiscipline,” requiring civil servants to spend Saturdays cleaning the streets and citizens, the last Saturday morning of each month, to clean up their environment (Peil 1991, 133-189). Mobile courts were set up to enforce the regulations emerging from this “War Against Filth.” While this program had temporary and limited success in Lagos, the capital city, it proved unsustainable. The Waste Disposal Board seldom supplied garbage bins or emptied the “refuse houses” that were constructed. It could not maintain its vehicles and other equipment. While sanitary inspectors were supposed to educate people about cleanliness and punish the uncooperative, their reputation as bribe-takers undermined their authority. Since industrial firms continued to dump their wastes wherever it was convenient, ordinary citizens were uninclined to take environmental cleanliness very seriously. Thus, by the early 1990s, “the disposal of refuse is hardly ever done correctly, with garbage being dumped in valleys or swamps, and untreated industrial liquid being pumped into public drains and surface water bodies (Aina, Etta, and Obi 1994, 208).

Interactions with the Public

The Japanese administration is sometimes presented as "overbearing," with corruption and favoritism, arbitrary and secretive authority, suppression of individuality and conflict, excessive promotion of obedience and passivity, intimidation of minorities and women, and disregard of the public (Van Wolferen, 1989). Hershkowitz and Salerni (1987), however, suggest that Japanese officials are just as concerned about public opinion as those in other MDCs and perhaps go to greater lengths to satisfy the public.

During the early 1970s, in the response to Tokyo citizens' opposition to constructing incinerators, because of the concern about accidents, garbage truck traffic, air pollution, and lowering of property values, the Prefecture's officials had to learn the hard way to respect public opinion in the handling of solid waste. Through this "garbage war," housewives and other concerned citizens sat down in front of garbage trucks and bulldozers until officials responded constructively to their protests. This opposition is responsible for the fact that Tokyo now needs twice as many incinerators as constructed in recent years (MacDougall 1989, 140). To mollify neighborhoods willing to accept incinerators, they are often equipped with heated swimming pools, recreation facilities, greenhouses, workshops, and other amenities desired by the public. Some also provide energy to sewage treatment plants, homes for the aged, schools, public buildings, and car wash or snow melting machinery. Tokyo's new city hall and a number of other public buildings are now heated from its Urban Garbage Heat System (Linden, 1993: 38). All plants and equipment, including garbage trucks, are kept spotless and in top shape. Plant interiors are beautifully designed, and the surrounding areas, attractively landscaped. To alleviate citizens' concerns about emissions, data recorded by the plants are displayed on outside billboards. Thus, despite citizen opposition, there are 13 incinerators operating in Tokyo, as against only two in New York where there is far more justifiable concern about air emissions[29] (Transatlantic Perspectives 1987).

The lack of public cooperation in Nigeria stems in part from the lack of interactions with citizens and services provided by local government. According to Lee and Anas, "the capacity, regularity, and quality of infrastructure vary from bad to worse within and across Nigerian cities" (1992, 1-3). The unreliability of electricity supplied by the Nigerian Electric Power Authority, for example, means that firms with more than 20 employees, must invest an average of US $130,000 for stand-by generators, making the cost of power to them about nine times higher than is observed in MDCs. Poor public telephone and postal services require the use of messengers on motorcycles or radio transmitters. Because of the lack of spare parts and maintenance capacity for repair equipment, roads are often in bad condition. For the reasons indicated, we find in Nigeria, on the one hand, the use of force as "a prevalent method of governance" (Agbese 1990, 244) and, on the other hand, the unenforceability of laws. Policemen and soldiers often set up illegal tollbooths on highways to extort bribes, ransack markets to loot goods, steal the proceeds of

[29] In parts of the United States, incinerator emissions run at a hundred times acceptable levels (Transatlantic Perspectives 1987).

sporting events, and in other ways maximize their income. Aina, Etta, and Obi (1994, 214) point out that "the urban poor, who are the main victims of weak and ineffective environmental planning and management, are made the scapegoats of environmental policies and laws." For example, following the enactment of the 1984 War Against Indiscipline programs, members of the Sanitation Task Force in Benue State used a vague law that was then enacted, disallowing coughing, spitting, or improper nose blowing, to harass numerous people, particularly those unable to come up with adequate bribes. However, such sanctions can hardly lead to sustainable development.

Comparative Analyses of Governance

One might, however, properly object to the effort to compare the degree of governance in Japan and Nigeria because of the "cultural gap" between these countries. After all, whereas Japan is a relatively homogeneous country, Nigeria includes about 250 ethnic groups, a large number of languages, and a dangerous Christian/Muslim division, along with a sizable number of traditional religions. Because of the disparity in education and income between Nigeria's largely "Christian South" and its "Muslim North," an increasingly meritocratic administration in Nigeria might be seen as "discriminatory." Furthermore, it is also true that the comparison of governance in Japan and Nigeria hardly illustrates a universal model of environmental management. However, these two extreme cases demonstrate that Japanese political software tends to be extremely strong, and three components of good governance (processes, capacities, and interactions) are very elastic - unlike the Nigerian case.

Let us look at another comparison - Nigeria and Indonesia. The comparison between Nigeria and Indonesia is worth looking at briefly in trying to understand how governances have functioned and what has to happen for not only socio-economic development but also sustainable development to take place.

Indonesia, it can be argued, with its many islands and ethnic groups, its problem with ethnic Chinese economic domination, and its village-oriented system of authority, came into independence in 1949 with even less of a concept of national power and national administration than did Nigeria in 1960 (Pye 1985, 112). Whereas Indonesia's GDP was below that of Nigeria in 1965 and not much ahead in 1980, it was three times that of Nigeria in 1990 (World Bank 1994, 17) and the level of sustainable development is much higher than that of Nigeria in 2000, by 42.6 and 31.8, respectively (WYC 2001, 14). While Nigeria's per capita GNP fell by 75 percent in the 1980s, Indonesia's per capita GNP, which has sustained 4.4 percent growth since 1965, ended the 1980s twice that of Nigeria (Lewis 1994, 10). Despite recent improvements in agricultural productivity in Nigeria, Indonesian agriculture has grown roughly three times faster than the Nigerian output. Likewise, in manufacturing, Indonesia was able to sustain a 12 percent annual growth during the 1980s, while Nigeria's production increase remained almost stagnant. Thus, Indonesian manufacturing comprised 20 percent of its GDP in 1990, as against about 8 percent of Nigeria's GDP (Werlin 1995, 130). Nigeria has declined from a country of relative affluence (about $1,000 per-capita annual income) in 1980 to poverty (less than $300 annual per-capita income). In terms of such social

indicators as infant mortality, life expectancy, per capita calorie intake, and access to safe water, Nigeria is considered among the poorest countries of sub-Saharan Africa (World Bank 1994, 1). Between 1960 and 1980, Nigeria's gross domestic income grew at the extraordinary annual rate of 81 percent, propelled by export earnings from petroleum up by more than 1,500 percent during these years (Olayiwola 1987, 1, 108). By 1985, this wealth had largely vanished, leaving the country increasingly in foreign debt, amounting to over $32 billion by 1992 (Maier 1992, 44).

There is a natural tendency to blame all Nigeria's troubles on the wealthy countries of the world; as in "the poor are poor," because "the rich are rich." Some believed in what might be called an "ICRC theory" (International, Capitalist, Racist Conspiracy). Some Nigerian scholars partly agree with this. Oil importing countries, according to Olayiwola (1987, 175) had deliberately used strategies to cause excess supply and depressed prices and to discourage industrialization. Yet, a comparison of Nigeria and Indonesia suggests a very different answer. Nigerian leaders are far less serious about development than their Indonesian counterparts. In other words, the level of governance has increased in Indonesia and decreased in Nigeria. The evidence can be summarized by applying the notion of political elasticity and software.

In the case of Indonesia, corruption has clearly had a serious impact on the quality of Indonesian life: industrial pollution is extensive; the urban poor continue to depend on polluted or expensive private water sources; human and solid waste disposal and drainage are badly neglected; and funds that could go for better living conditions are wasted on general administration and office buildings. This corruption is intensified by low salaries, an emphasis on seniority and loyalty rather than competence, an inadequate legal system, and unreliable taxation and cost-recovery efforts (Mehmet 1993; World Bank 1991; Devas 1989).

Indonesian leaders in recent years, however, have attempted to limit the damage of corruption to construct good governance in the following two ways. The first is the encouragement of private sector development and functional differentiation of bureaucracy. Following the decline of oil prices during the 1980s, Indonesia deliberately decreased dependence on oil income (from 45 percent in the early 1970s to 38 percent in the 1990s), whereas Nigeria increased its dependence from about two-thirds of income in the early 1970s to more than 90 percent (Lewis 1994, 11). A number of useful steps were taken to open up the economy: decreasing protection of the industrial and agricultural sectors; reducing non-tariff barriers; improving the incentive system for the private sector; keeping inflation and government related debt relatively limited; and supporting essential infrastructure and agricultural services. President Suharto had taken a personal interest in certain industries, such as textiles, overcoming existing problems and barriers (MacIntre 1991). While the President had no intention of democratizing Indonesia, he had used and protected a highly respected group of U.S.-trained economists and technical experts for purposes of socio-economic development (Lewis 1994, 17; Bhattacharya and Pangestu 1993). He had also used and protected Chinese business groups, encouraging a productive alliance of Chinese business interests and retired

military officers. The second way Indonesia attempted to construct good governance was human resource development and public engagement in political processes. Between 1970 and 1990, the percentage of the Indonesian population in absolute poverty has declined from 60 percent to 15 percent, thereby achieving "one of the fastest reductions in poverty and improvements in key social indicators among all developing countries" (Bhattacharya and Pangestu 1993, 43). Great progress has been made in infant survival, life expectancy, literacy, school enrollments, and access to health services. The fact that females now constitute 48 percent of primary school enrollment and 45 percent of secondary school enrollment partly explains the greater success of family planning in Indonesia than Nigeria (World Bank 2000).

While Indonesia remains a highly authoritarian regime and in Nigeria, following nearly 16 years of military rule, a new constitution adopted in 1999, and a peaceful transition to civilian government was completed, these evidences critically show the different levels of quality of governance between Indonesia and Nigeria. In Indonesia, the employment of university graduates in the civil service rose by 48 percent between 1988 and 1992, suggesting the slow shift to a meritocratic administration and fortifying political software. President Suharto had faced considerable opposition to his reform efforts, but, in contrast to his Nigerian counterparts, he had been more persistent and resourceful in surmounting intra-state resistance (Lewis 1994, 25). On the other hand, in Nigeria, Lindauer and Roemer (1993, 6), in their comparison of Asia and Africa, suggest that there is a greater willingness of Asian leaders than there is of African leaders to elevate public goals over private gains. As we narrow our comparison to Indonesia and Nigeria, we certainly find this to be the case. While corruption exists in both countries, Lewis (1994, 15) sees it as "primitive accumulation" in Nigeria and "productive accumulation" in Indonesia. Using Wolin's two definitions of politics, we can say that in Nigeria partisan politics prevails over consensus politics far more than in Indonesia. In Nigeria, politics is seen "as a competition between ruling-class factions over access to state resources" (Forrest 1993, 4). This is the case about "political illness" (Werlin 1995, 128).

During the 1960s, the federal civil service in Nigeria was relatively well respected, in accord with the British Westminster-Whitehall model (Metz 1992, 239). Since then, it has become "reputedly the most bureau pathologic in the area" (Caiden 1991, 257). The deterioration of the civil service is acknowledged by a leading Nigerian business organization (the Organized Private Sector Group): "corruption has become institutionalized at all levels of government affecting industrial and business operations" (Maier 1992, 44). The country's oil wealth has been undermined by corruption and siphoned into bureaucratic expansion, entrenchment, and enrichment (Koehn 1990, 275-276). "The World Bank estimated that $2.1 billion in petroleum receipts were diverted in 1990 and 1991 to extra-budgetary accounts, much of which were disbursed to regime loyalists and strategic constituents" (Lewis 1994a, 330). Despite improvements in import-export system under the Structural Adjustment Program (SAP) introduced in 1986, businesses that abide by the rules continue to be penalized, suffering from arbitrary and unexpected shifts in prohibitions, controls, fees, and tariffs (World Bank 1994, 13). Even getting in and out of the Murtala Muhammed

Airport in Lagos without being robbed or forced to pay bribes can be so difficult that the American government no longer allows direct flights between the United States and Nigeria (French 1994, A4).

The undermining of governance in Nigeria can be seen as a deliberate process. "The ruling class has shown remarkably little capacity or inclination to restrain itself" (Koehn 1990, 283). Much of the progress that was made under the SAP has been reversed by the recent "descent into unbridled corruption and patronage politics" (Lewis 1994a, 338). A World Bank report (1994, 22-23) notes that, since 1982, "Nigeria has not published audited, final budgetary accounts," and that extra-budgetary spending has increased from 22 percent of total spending in 1986 to 65 percent in 1992. Much of the military equipment sold to Nigeria is intended for pay-off purposes, not for real use (Coll and Shiner 1994). While, in some respects, the Nigerian elite may be less authoritarian than the Indonesian elite, it is clearly far less interested in constructing good governance, as well as sustaining development. "Technical insolvency and financial distress in Nigeria appear to be pervasive and increasing" (World Bank 1994, 47).

In trying to explain why African ruling classes seem so much more counterproductive than their Asian counterparts, one of the most compelling arguments is that nationalism has failed to develop in Africa, as against ethnic, religious, or other traditional ties. While nationalism has taken various important forms in Africa (as anti-colonialism, pride in African culture, and justification for authoritarian rule), it has not yet led to a real sense of patriotism and to its own governance. "As the expectations created by the promises of militant nationalism gave way to disappointment, disillusionment, and by 1900 in much of Africa, despair, state-based nationalism had a hollow ring" (Young 1994, 69). Other authors emphasize Confucian beliefs, the pre-colonial domination of particular individuals or groups, greater external threats, and the influence of traditional work ethics (Perkins and Roemer 1993). While I respect the argument that nationalism is less well-developed in Africa than in Asia or that different ethos existed in both continents, I remain uncertain why "political illness" seems so much more pervasive in some countries or parts of the world than in others. Looking at more or less neighboring countries, we find environmental sustainability and socio-economic development more apparent in Zimbabwe (52) than in Zambia (39.8), in Tunisia (43.7) than in Algeria (38.9), in Costa Rica (58.8) than in Nicaragua (51.9) or El Salvador (43.7), in Thailand (45.2) than in Vietnam (34.2), in the Czech Republic (57.2) than in Romania (44.1), and so forth.[30] The answers found in the literature point to different historical circumstances, socio-economic factors, and choice of policies. Yet, I hesitate to buy these answers. Just as with alcoholism, we are uncertain why it affects certain societies, families, and individuals more than others, so it is with political illness. As argued in this study, different qualities of governance based on political software and elasticity can provide more reliable answers to that question.

[30] All scores indicate the level of environmental sustainability quantified by WYC (2001, 13-5).

4. Summary

This chapter discussed conceptual debates and empirical indicators of governance, which provide positive heuristic characteristics in research programming. The concept of governance encompasses much broader public policy considerations than assessment of government structure, and consequently, as this study argues, complex relationships between political and other social spheres must be developed to improve the quality of governance. Delineating the notions of political elasticity / software and surveying comparative analyses of governance on national levels, this chapter also showed how governance functions differently in environmental management and policies. In the next chapter, other explanatory conditions to the degree of environmental sustainability will be investigated. They include the level of democracy as a socio-political condition, economic growth rate as an economic function, and the level of global economic integration as an international factor on environmental sustainability.

Chapter Three. Democracy, Economy and the Environment

This chapter will discuss the impacts of democratic, economic, and international factors on the degree of environmental sustainability and survey competing arguments of their relationships. They include (1) the function of democracy and democratization as socio-political conditions, (2) the economic impact of growth, and (3) the consequences of global economic integration and UN environmental conferences as international factors to environmental sustainability in national level analyses.

1 Democracy and the Environment

Over the past decade the linkages between the environment and socio-political conditions and democracy/democratization in particular have increasingly attracted the attention of political analysts. Reflection has been stimulated by surveys of changing public attitudes towards environmental protection (Inglehart 1995; Dunlap et al. 1993; Dunlap and Mertig 1994; Hofrichter 1991; MacDermid et al. 1991; Witherspoon 1993); by debates about the structures, practices and ethos of governmental agencies entrusted with environmental management (Lester 1989; Janicke 1992; Glasbergen and Driessen 1994; Weale 1992); by discussion of the appropriate balance of lay and expert inputs to environmental decision making and environmental risk assessment (Fiorino 1989; Beck 1992; Fischer 1993; Luke 1993); and by arguments within / around green and environmental movements over the strategic and tactical orientation of their campaigns for social change (Dobson 1990; Goodin 1992; Saward 1993). In a more general sense this concern is related to the widespread recognition that the environment has now emerged as a standing locus of political conflict (both internationally and within national and local jurisdictions) and to the renewed interest in democracy which has accompanied the recent extension of representative-democratic forms to new areas in Latin America, East Asia, and East / Central Europe (Dunn 1992; Budge and McKay 1994; Copp, *et al*. 1993). However, despite the increased frequency with which democracy and the environment are now associated, surprisingly few political analysts have attempted to examine the general nature of the democracy/environment interaction.[31]

Are democracy and/or democratization positively associated with better environmental sustainability? It is still an open question as to whether environmental policies appreciably improved in democratic societies or after democratic transitions.[32] The preponderance of the literature supports the

[31] A great deal of recent academic debate has been more narrowly focused on the issue of green democracy: is the green commitment to democracy principled or tactical; what forms of democracy would best suit green communities? For accounts of the historical development of green democracy and green politics around the world, see Parkin (1989), Rommel (1989), Kitschelt (1989), Radig (1991), Richardson and Routes (1995), O'Neill (1997), and Shull (1999)..

[32] Democratization involves roughly three conceptually distinguishable, but empirically overlapping, stages. The first stage involves the demise or termination of the nondemocratic regime (authoritarian breakdown). The second occurs when the procedural minimum of democracy is established or recovered and the democratic regime is inaugurated (democratic transition). The third phase involves, on the one hand, the prevention of an authoritarian regression and, on the other, the protection, preservation, and deepening of the democratic system (democratic consolidation). In democratic consolidation, a democracy

conclusion that environmental policy outputs and enforcement should significantly improve in a democratic society or after a democratic transition. Rodgers states: "the spread of democracy is a prerequisite for the achievement of better environmental policies, (and) many scholars agree that the inferior ecological record of the Soviet Union and its satellites owed much to the closed nature of communist societies" (Rodgers 1995, 41-42). There are two core assumptions behind this view. They are (1) the mass public, issue groups and pressure groups want better environmental policies; and (2) they will use various procedural structures that are normally associated with democratic regimes to push forward their environmental agenda (Inglehart 1995; Dunlop, Gallup and Gallup 1993). Some of these structures include laws that guarantee increased public participation for individuals or members of groups in the political process, political campaigns and elections, free speech, press and assembly, and increased access to information about government politics (Meadowcraft 1996).

In articulating their support for global democratization, U.S. political leaders also have linked democracy and the environment. For example, candidate Bill Clinton boasted during the 1992 presidential campaign that democracies, among their other virtues, "are more likely to . . . protect the global environment."[33] Clinton's running mate, Albert Gore, Jr., claimed that the spread of democracy is a prerequisite for the achievement of better environmental policies (Gore 1992, 179). Even before the extent and intensity of ecological damage in the former Soviet bloc became widely known, McCloskey agreed with the politicians. He wrote: "Many of the important ecological measures that are being implemented are being implemented in democracies . . .. By contrast, if we consider actual totalitarian states - China, Chile, the USSR, Argentina, the dictatorships of Africa and the Arab world - we find that they are far from ecologically minded . . .. China and the USSR are among the worst ecological offenders" (McCloskey 1983, 157).

In a historical perspective, however, many prominent environmentalists and economists since the 1970s were skeptical of democracy. Even more they have often argued that authoritarianism might be needed to cope with "limits to growth" (Ophuls 1977; Ehrlich 1968; Hardin 1977; Heilbroner 1974). Their rationale is that liberal democracy's stress on individual liberty eventually promotes ecological catastrophe. It lamented (1) the freedom of individuals to pollute, consume, and procreate; (2) the inability of limited government to control the "tragedy of the commons"; and (3) the tendency of the United States, the world's leading democracy, to equate economic development with food aid (Paehlke 1989). Although these critics' arguments were speculative and are rarely heard today, their warnings helped to spark environmental movements and legislation in most of MDCs. A contemporary charge is that democracies fail to protect the

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becomes so broadly and profoundly legitimate among its citizens that it is very unlikely to break down (Diamond and Plattner 1996; Linz and Stepan 1996; Dominguez 1998). Political rights are also extended more broadly to accommodate traditionally marginalized segments of the populace. Linz and Stepan (1996) define democratic consolidation in terms of three dimensions –behavioral, attitudinal, and constitutional.

[33] In his address delivered at Georgetown University, Washington, D.C., 12 December 1991, Presidential candidate Clinton proposed a new covenant for American security and new world order, articulating human rights, social equality, democratic norms, and environmental protection.

environment because of strong business interests and, more broadly, a massive societal stake in continued economic growth. Business has vast political and economic resources, clout that is often mobilized on behalf of growth and against environmentalism. Indeed, some commentators have concluded that the strong and durable position of business within democratic societies leaves environmental causes little chance of success (Dryzek 1987, 120-31; Kann 1986, 252-74). Clearly, this is a serious issue that must be confronted.

At present, however, there is little direct empirical research on the possible affinities between democracy and ecology. Previous research consists mainly of case studies of one or a few developed democracies. Non-democratic and non-developed states tend to be overlooked altogether. The prospects for more broadly based research are poor. Neither scholars nor governments nor international organizations have as yet fully assessed environmental conditions and policies across a wide range of nation-states. The key barrier is lack of consensus about terminologies, standards, and data. No one really knows the quality of environmental conditions in most countries, especially outside North America and Western Europe (Vogel and Kun 1987; Knoepfel, Lundqvust, Prudhomme, and Wagner 1987; Gleditsch and Sverdrup 1995).[34]

Given the absence of better data, the best empirical evidence about the link between regime type and ecology comes from fairly recent case studies of nondemocratic systems. Specifically, the most interesting work focuses on the poor environmental records of former Soviet bloc states and China. Many scholars agree that the inferior ecological record of the Soviet Union and its satellites owed much to the closed nature of communist societies. Consequently, environmentalism initially gained strength in Russia after Mikhail Gorbachev instituted *"glasnost"* and democratization allowed greater expression of ecological concerns (Waller and Millard 1992; Ziegler 1987; 1992; Pryde 1991, 246-65; Goldman 1992; Ross 1988). Protests against environmental destruction became an important part of the general opposition to the communist regimes in Eastern Europe that eventually resulted in their collapse (Desai and Snavely 1995; Jancar-Webster 1993). For instance, in the former Soviet Union, the Chernobyl disaster "opened the public's eyes not only to environmental degradation, but to the bankrupt policies that had brought on the catastrophe" (Jancar-Webster 1993:211). A broad consensus that the overthrow of the communist regime was the only fundamental solution helped environmental movement groups recruit mass support for their protests against the totalitarian regime (Jancar-Webster 1993:214). Similar to the case of the former Soviet Union, environmentalists in most newly democratized states, through the global trends of the Third Wave democratization, provided the cradle for the democratic movement, helping people learn democratic tactics with which to challenge and oppose the authoritarian regime (Jancar-Webster, 1993:217).

However, the pervasiveness of evidence also seems to support the view that environmental conditions have only marginally improved in most post-communist states after democratic transitions and

[34] The work of Gleditsch and Sverdrup (1995) is considered one of the first efforts to make use of global quantitative data.

have not improved at all in others. The power of environmental groups in Eastern and Central European countries "fractured" after the democratic transition (Harashima and Morita 1998; Kim 2000).

China's case also challenges the Western-oriented normative and conventional wisdom that democracy should be constructed first and should function as the prime explanatory variable to societal phenomena including social integration, economic and political development, and environmental protection (Albrecht 1987; Alcamo 1992; Bolan 1992; Feffer 1992; Singleton 1987; Ziegler 1987). Since the early 1970s, China has produced a large body of environmental laws and regulations and institutionalized a massive national environmental bureaucracy. China also has long been a willing participant in international global ecological politics (Lee et al. 1995; Harashima and Morita 1998). Through the 1973 national conference on the environment, the principles of environmental protection were introduced into the Chinese Constitution of 1978 when the Chinese government launched the "Reforming and Opening up to the Outside World" policy (Zhang and Jin 1992). At the same time, the government initiated a campaign for comprehensive utilization of three industrial wastes (gas, water, and solids) to reduce the hazards of pollution (Ou 1991, 261-7). The Party Central Committee also approved the "Main Points of a Work Report on Environmental Protection" drafted by the Environmental Protection Leading Group of the State Council. This report states that elimination of pollution and protections of the environment were important components of China's socialist construction and modernization (Harashima and Morita 1998). The Environmental Protection Law indicates that the polluter must be responsible for pollution treatment, an environmental impact assessment system, a "polluter pays" fee system, and the "Three Simultaneity System."[35] Since the mid-1980s, China has adopted a positive stance on environmental diplomacy in an effort to maintain good international relations. For instance, in 1991, in preparation for the "Earth Summit" of 1992, the Chinese government hosted the Ministerial Conference of the Environment and Development. This conference adopted the Beijing Declaration, which demanded that new and additional financing and technology be transferred from MDCs to LDCs. If the prevailing view about the democracy / democratization hypothesis is true, then "China should not have made as much progress as it has made in the past three decades" (Harashima and Morita 1998, 42).

Does the evolution of environmental interest in governments always require outside domestic social movement stimulus? Again, China's case brings this generalized question into question. Its environmental efforts have moved forward with little or no direct domestic extra-governmental influence such as a social environmental movement. Furthermore, the connection between political democracy and environmental protection appears less compelling when focus is on the rich industrial countries. Environmental pollution and ecological destruction have reached very high levels in the Western democracies. Most of the greenhouse gasses responsible for global warming, most of the chemicals

[35] The Three Simultaneity System states that for all newly built, rebuilt, or expanded projects or projects undergoing technological transformation, facilities for preventing pollution or other public hazards should be designed, constructed, and put into operation simultaneously with the main project (Ou 1991).

responsible for the hole in the ozone layer, and most of the hazardous and toxic wastes are produced by the democratic industrial countries.

The historical record of ecological destruction in democracies does not inspire much confidence in their ability to protect the environment. In this debate, the nexus of democracy and the environment should be analyzed with incorporating economic variables.

2. The Nexus of Economic Growth and the Environment

This is perhaps the central issue in the global environment debate. What is the relationship between expanding human economy and environmental sustainability? The relationship between economic activities and the level of environmental quality is extremely complex. There are two competing arguments about the relationship in spite of analyzing the same phenomena and of using the same data. While researchers of negative arguments, known as the Limit to Growth (LG) hypothesis, contend that expanding human economy should be associated with an increase in environmental degradation (Schnaiberg and Gould 1994; Redclift and Goodman 1991; Daly 1979; 1996; Wilson 1988; 1992), positivists - advocates of the Inverted U Curve (IUC) hypothesis - delineate that expanding economic activities do not necessarily harm the environment (Grossman and Krueger 1993; 1995; Selden and Song 1994; Holtz-Eakin and Selden 1995; Shafik and Bandyopadhyay 1992). The IUC hypothesis suggests that although environmental quality may worsen with economic growth in LDCs, it eventually improves with growth once countries become sufficiently rich.

For the positivists, the dominant model of economic growth, based on neoclassical economics, does not consider the environment to be relevant to economics or economic development. It assumes that "there is not only an infinite supply of natural resources but also of *sinks* for disposing of the waste from exploiting these resources - provided that the free market is operating" (Porter and Brown 1991, 27). In this view, "the problems of raw materials exhaustion or pollution are minor diversions"; environmental pollution is an example of "negative externality" and only a matter of "minor resource misallocation" (Pearce 1986,15). On the other hand, for the negativists, the environment is in an enduring conflict with this model of growth (Schnaiberg and Gould 1994). Economic growth requires exploitation of natural resources for expanding production of material goods and dumping of the waste products of this production into the environment. The modern "treadmill of production" inexorably degrades the environment (Schnaiberg and Gould 1994, v). In MDCs, mass production and consumption are a major cause of environmental degradation and destruction of natural resources. In LDCs, "the creation of value and access to subsistence are typically linked to sacrificing environmental quality for short-term economic gain" (Redclift and Goodman 1991,5). Let us look at more precisely the rationales of two schools.

Limits-to-Growth (LG) Hypothesis

Clearly, current human activities are causing environmental destruction at a scale and pace unprecedented in human history (Daly 1979; 1996; Wilson 1988; 1992; Reid and Miller 1989). Moreover, any specific natural resource is finite and therefore there are absolute limits on its use. In addition, biological and physical systems underlie all economic activity and form constraints to which the human economy must adapt. For most biologists, environmentalists, and ecological economists, the dominant paradigm for understanding the interactions between human economic activities and the environment is the concept of limits. Their idea is that there are biological and physical limits to economic growth beyond which both ecological and economic collapse would occur. In this view, limits are seen as absolute constraints on economic activity, not just as a point beyond which economic growth results in environmental destruction. This concept of limits is a common theme, from limits on arable land (Malthus 1836), to energy and material limits (Meadows et al. 1972; 1992), to the economic scale and thermodynamic limits proposed by ecological economists (Daly 1979; 1996).

What is meant by ecological limits to economic growth can best be seen in the rivet metaphor developed by Paul and Anne Ehrlich (1981). In this well-known metaphor, an airplane is analogous to Earth. Each act of environmental destruction (loss of a species, in the original metaphor) is like pulling a rivet from the plane's wing. The wing has lots of rivets, so nothing happens when the first few rivets go. But eventually and inevitably, as more rivets are pulled, the wings break off and the plane crashes. In a related metaphor, environmental destruction is likened to speeding toward a cliff in a car. If the car does not stop, it will eventually go over the cliff. Four essential aspects of the rivet and cliff metaphors shape thinking about environmental problems. First, the transition from no effect to effect is abrupt. That initial changes have little effect contributes to a false sense of security and unwillingness to recognize limits and change course. Second, when limits are reached, the results are catastrophic-the plane crashes; the car goes over the cliff. Limits theorists generally predict that, if limits are reached or exceeded, there will be an ecological collapse which will in turn force a collapse of the human economy. Both economic scale and environmental quality collapse when limits are reached. Limits are seen as absolute constraints on economic activity, not just as points beyond which economic growth results in environmental degradation. Either we will limit growth in ways of our choosing or it will be limited in ways not of our choosing (Ludwig 1996: 16). The third essential component of these metaphors is that, in the event of a catastrophe, everyone suffers and therefore everyone has a clear self-interest in avoiding a crash. The last essential aspect of the metaphors is their irreversibility. Once the plane has crashed or the car goes over the cliff there is no return to the prior conditions.

The limits metaphor is a statement about the nature of both biophysical and human economic systems; therefore, limits need to be analyzed from both natural and social science perspectives. And, because human economies transport both inputs and wastes across the globe, the issue of biophysical limits to economic activity is best examined at a global scale. There are three types of possible limits.

a. Input Limits

Until recently, input limitations received the most attention. Malthus (1836) predicted that limited arable land would restrict the size of the human population through food shortages and starvation. LG models of Meadows et al. (1972) focused on a broader array of inputs but retained the basic Malthusian message: limited natural resources must limit human population and economic activity. Similarly, in *The Population Bomb*, Ehrlich (1968) predicted that hundreds of millions of people would starve to death in the 1970s from absolute food shortages. These predictions of absolute limits to the size of the economy due to resource exhaustion have repeatedly not been borne out. For example, despite over 150 years of predictions to the contrary, food production has consistently kept up with population growth. Between 1950 and 1985, total production of major food crops increased by more than 160%, more than matching population growth (Brown 1995). Millions of people starve or are malnourished every year, but not because of an absolute shortage of food (Sen 1981). Predictions of economic limits imposed by limited resources generally fail because they are based on the assumption that limits can be calculated according to current resource use and current resource stocks.

b. Waste Absorption Limits

In the 1980s, as the specter of aggregate material or energy shortages diminished, thinking on limits turned to the issue of waste absorption. Problems of waste absorption are potentially much more difficult to address than input constraints because pollution has the potential to cause irreversible and irreparable environmental harm and because there can be long time lags in detecting adverse affects. Furthermore, although economic incentives may at times encourage substitution for depleted inputs, economic incentives often also discourage reduction of pollution and encourage firms to locate in areas with lax environmental regulations (Daly 1996). For all of these reasons, environmental degradation caused by waste production is a difficult ecological, technical, and social problem. However, the problem is not well illuminated by the concept of limits. Clearly, pollution is causing massive environmental destruction and affecting human well-being. For example, widespread emissions of toxic chemicals may be responsible for soaring cancer rates. Industrial chemicals are found in the bodies of wildlife in even the most remote parts of the globe (Colborn et al. 1993). However, the fact that pollution is causing environmental degradation does not necessarily mean that there are catastrophic limit points. If there is a continuum of adverse effects, humans have to decide how much pollution we are willing to emit and what levels of environmental impacts we can live with. However, there may be no threshold point at which we must stop to avoid spiraling destruction.

c. Entropy and Primary Productivity Limits

Daly (1979; 1996) has developed a limits analysis that combines input and waste limits into constraints on throughput and the scale of the economy. Throughput is the total volume of material and energy flowing through the economy, starting as inputs and leaving as waste. Unlike Meadows et al. (1972) in *The Limits to Growth*, Daly does not assert that we are running out of material inputs. He recognizes the flexibility of production and does not want to tie limits to the use of any specific resource for which there may be substitutes. Instead, building on work by Georgescu-Roegen (1971), Daly appeals to limits on aggregate throughput based on thermodynamics and entropy, for which there is no substitution escape. He idea is that the earth and sun constitute a closed system. The total amount of matter and energy in the system is fixed and constant; however, there is a continuous, irreversible decline in the level of entropy.[36] Although entropy or thermodynamic limits are, theoretically, absolute, they are meaningful only if the human economy has a chance of approaching the limit. To be useful, the idea of entropy limits needs to be at least roughly quantifiable. What are the limits, and what is the size of the current global economy relative to those limits? Daly attempts to quantify these limits by referring to an analysis by Vitousek et al. (1986) of human use of net primary productivity (NPP). NPP is the solar energy captured by plants and other photosynthetic organisms minus that used by the organisms themselves for respiration. Vitousek et al. (1986) estimate that humans currently "appropriate" 25% of potential total global NPP and 40% of potential terrestrial NPP. Daly (1996) concluded that humans are therefore only 80 years away or less (two population doubling times) from appropriating the entire NPP, which he contends would be a biological disaster.[37]

Environmentalists have often predicted impending catastrophes (e.g., oil depletion, absolute food shortages and mass starvation, or biological collapse). This catastrophism is ultimately damaging to the cause of environmental protection. First, predictions of catastrophe, like the boy who cries wolf, at first motivate people's concern, but when the threat repeatedly turns out to be less severe than predicted, people ignore future warnings. Secondly, the belief in impending catastrophe has in the past led some

[36] Humans use low-entropy energy from the sun and fossil fuel stocks and release high-entropy wastes. Early human societies relied primarily on energy from the sun; industrialized economies now depend primarily on the limited stock of fossil fuels.

[37] However, there are a number of serious problems with the NPP argument. First, human use of NPP is not an appropriate metric to assess possible entropy or thermodynamic limits. Entropy represents a theoretical limit to the economy because it encompasses all available energy. NPP, on the other hand, represents only a small fraction of even just the solar energy available on Earth. An entropy or thermodynamic limit to the economy implies that total human energy use is in danger of exceeding energy availability. Yet solar energy flow to Earth is many thousands of times greater than current global energy use (Dunn 1986). Although Daly (1996) appeals to entropy and thermodynamic limits, his NPP argument is more akin to earlier input limitation scenarios. The argument that NPP is an input limit suffers from the same flaws as other input limit arguments. Unlike entropy, total NPP is not fixed and may be increased in agriculture. More important, other inputs can be substituted for the products of primary producers. Direct solar energy can be used instead of firewood, and adobe, concrete, or steel can be used instead of wood for building materials.

environmentalists to support withholding food and medical aid to LDCs (Hardin 1972), forced sterilization (Ehrlich 1968), and other repressive measures. Not only are these positions repulsive from a social justice perspective, they also misdirect energy away from real solutions. And, by blaming people in LDCs for global environmental problems, these views have tended to limit support for environmentalism to the affluent in the highly industrialized world. Fortunately, environmentalists of widely differing political perspectives, including some leading limits thinkers, now see alleviating human misery and poverty as essential to solving global environmental problems (Athanasiou 1996, Daily and Ehrlich 1996, Ehrlich 1997). In addition to recognizing the need to address poverty and inequality, recent limits writing has reduced its focus on catastrophe.

Historically, the limits metaphor has been part of a broader environmental and social analysis developed by authors such as Donella and Dennis Meadows, Paul and Anne Ehrlich, and Herman Daly. By focusing on aggregate quantities of natural resources, consumption, and population, the limits perspective depoliticizes our understanding of environmental destruction. What we consume, how much we consume, and how goods are produced are all political decisions that change over time and vary from country to country. Yet in the limits perspective, consumption and production technology are seen as more or less fixed, and significant social change is not even considered a possibility.

Inverted U-Curve Hypothesis[38]

A simple theoretical model of pollution was developed that generated an Inverted U-Curve (IUC) relationship between per capita income and environmental quality.[39] Substantial evidence points to an IUC relationship between per capita income and various types of pollution, suggesting that while the early stages of economic growth causes the problem, later ones bring the remedy. For example, Grossman and Krueger (1993, 1995) find the IUC relationship for two measures of air pollution (sulphur dioxide and smoke) and several measures of water pollution (oxygen loss and concentrations of several heavy metals). Selden and Song (1994), Holtz-Eakin and Selden (1992, 1995), and Shafik and Bandyopadhyay (1992) also find similar patterns to Grossman and Krueger's evidence in related work and suggest the IUC relationship is a statistical regularity. As seen in Table 3.1, there are five models of the IUC hypothesis between various economic activities and environmental quality and/or performance. Although there is a little difference in

[38] S. Kuznets constructed the original Inverted U-Curve (IUC) hypothesis in a different context. Economics Nobel prizes winner Kuznets hypothesized the relationship between economic growth and income inequality (Kuznets 1955). He argued that income inequality seems to emerge as an inverted u-curve relationship with economic growth: that is, personal income inequality first increases and then decreases in the course of economic growth.

[39] Although I use the term environmental sustainability in its broadest sense to include biological diversity, resilience, and aesthetic, recreation, refuge, and ecosystem service values to humans, for IUC theorists environmental quality refers to various categories of pollutants. See chapter I for more details of conceptual and operational definitions and the scope.

Table 3.1. Selected Studies of the IUC Relationship

Grossman and Krueger (1995, 1993)	$Y_{it} = G_{it}\beta_1 + G_{it}^2\beta_2 + G_{it}^3\beta_3 + \bar{G}_{it-}\beta_4 + \bar{G}_{it-}^2\beta_5 + \bar{G}_{it-}^3\beta_6 + X_{it}'\beta_7 + \varepsilon_{it}$, IUC relationships between urban incomes and two measures of air pollution (sulphur dioxide and smoke) and several measures of water pollution (oxygen loss and concentrations of several heavy metals) in 4 to 32 countries during 1977-1988. Pollution data from the Global Environmental Monitoring System (GEMS) Econonimc data from Penn World Table :Mark V (Summers and Heston 1991)
Selden and Song (1994)	$m_{it} = \beta_0 + \beta_1 y_{it} + \beta_2 y_{it}^2 + \beta_d d_{it} + \beta_{79} T_{79} + \beta_{82} T_{82} + c_i + u_{it}$, An IUC relationship between per capita GDP and per capita national emissions of SO_2, SMP, NO_2, and CO. National pollution emission of fuel use in 5 to 30 countries in 1973-75, 1979-81, and 1982-84. Pollution data source from World Resources Institute (WRI 1991)
Holtz-Eakin and Selden (1992)	$C_{it} = \beta_0 + \beta_1 y_{it} + \beta_2 y_{it}^2 + \gamma_t + f_i + \in_{it}$ $C_{it} = \alpha_0 + \alpha_1 (\ln y_{it}) + \alpha_2 (\ln y_{it})^2 + \gamma_t + f_i + \in_{it}$ IUC: development trajectory for CO_2 emissions (main cause of greenhouse gases). Their damage to the environment occurs through climate change or ozone depletion on global scale. County-specific pollution data for the years 1951-1986 from Oak Ridge National Laboratory.
Shafik and Bandyopa-dhyay (1992)	$E_i = a_1 + a_2 \log y + a_3 t$ $E_i = a_1 + a_2 \log y + a_3 \log y^2 + a_4 t$ $E_i = a_1 + a_2 \log y + a_3 \log y^2 + a_4 \log y^3 + a_5 t$ IUC relationships between various environmental indicators (SO_2 and SPM carbon emissions, concentration of dissolved oxygen in river, and municipal solid wastes emissions) and national income Data from World Bank's database involving up to 149 countries from 1960 to 1980.
Lheem (2001)	$Q_t = \delta_0 + \delta_1 y_t + \delta_2 (y_t)^2 + \delta_3 eop_t + \delta_4 mfs_t + \delta_5 hcp + \varepsilon_t$. Although this model confirms an IUC between per capita emissions of SO_2, NO_2, CO, and SMP and per capita GDP, economic openness shows different shaped-curves from the previous studies. The relationship between overall emissions and economic openness is a U-shaped curve, and the relationship between per capita emissions and economic openness is cubic-shaped curve. Pollution data from World Resources Institute (WRI 1992/3). Economic data from World Development Report (World Bank 1975-1992) & United Nations Statistical Yearbook (UN 1985/ 1996) Human capital data from Index of (Man) Power Resources (Vanhanen 1997)

terms of methodologies, frames, sampling, data sources among these economics-based research, their overall arguments support the general IUC relationships.

Summarizing public concerns about the environmental impacts of expanding economic activities, specifically regional econom ic integrations,[40] Grossman and Krueger (1993; 1995) outline three possible effects from trade liberalization on environmental quality such as scale effect, composition effect and technique effect. [41] Contrary to the LG hypothesis, they find no evidence that economic growth does unavoidable harm to the natural habitat. Instead they argue that while increases in GDP may be associated with worsening environmental conditions in many LDCs, air and water quality appear to benefit from economic growth once some critical level of income has been reached. The turning points in the IUC relationships vary for the different pollutants, but in almost every case they occur at an annual income of less than $8000.[42] For a country with per capita income of $10,000 or more, the hypothesis that further growth would be associated with deterioration of environmental conditions was also rejected with statistical significance. Their findings are broadly consistent with those reported in other studies. For example, the World Bank Development Report (1992) also reports an IUC relationship between per capita income and concentrations of Sulfur Dioxide (SO_2) and Suspended Particulate Matter (SPM) in city air, with turning points even lower than those suggested by Grossman and Krueger. Moreover, they find that both the percentage of the population without access to safe water and the percentage of urban population without adequate sanitation decline steadily at all levels of income increase.

Selden and Song (1994) examine the relationship between environmental quality and economic development by looking at four commonly encountered air pollutants.[43] They find that the pollutants

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[40] There have emerged regional economic integration and/or common markets among countries. They include the EU in Europe (15 member states), the NAFTA in North America (3 states), ASEAN in Southeast Asia (10 states), the APEC in the Pacific Rim (21 states), the MERCOSUR in Latin America (4 states). These multinational economic and trade agreements are part of a move for nation-states to cooperate with one another more fully.

[41] On the scale effect, international trade and investment liberalization usually expand economic activities through market extension. The harmful pollution can thus rise proportionally as a by-product of the increase in economic output. The second is composition effect, resulting from a country's increasing specialization in its production according to comparative advantage. If the comparative advantage happens to be a country's loose pollution control regulations, or lower pollution costs, then it is possible to induce dirty industry to locate in that area, and to damage environmental quality in that country. On the other hand, if the comparative advantage derives from abundant natural resources and raw materials, then environmental quality may improve, since raw material industries are in general less polluting intensive than manufacturing industries. The last is technique effect. Industrial countries may transfer modern technologies to less developed countries during international trade. Modern technologies are in general cleaner and more efficient in utilizing natural resources. Therefore, less pollution per unit of output is generated.

[42] The income level was standardized in terms of the 1985 U.S. dollar.

[43] They include Sulfur Dioxide (SO_2), Suspended Particulate Matter (SPM), Oxides of Nitrogen (NO_2) and Carbon Monoxide (CO).

exhibit IUC relationship with per capita GDP while the turning points estimation is much higher, about double Grossman and Krueger's results.[44]

Holtz-Eakin and Selden's study (1992) focuses on estimating and forecasting the development trajectory for one of the greenhouse gases (mainly from CO_2 emissions). Unlike pollutants such as SO_2, SPM, Oxides of Nitrogen (NO_2) and Carbon Monoxide (CO), which have significant health and environmental effects within the emitting country, the greenhouse gases are less restricted to local areas. Their damage to the environment occurs through climate change or ozone depletion on a global scale. The global nature of these pollutants reduces the incentive for abating their emissions from any single country unilaterally. Also many of these pollutants are substantially more costly to abate, exacerbating the free-rider problem in countries. It is, therefore, interesting to develop detailed information on the emission-economic growth link across the world. Their study also confirms the IUC hypothesis for CO_2 emissions.[45]

Shafik and Bandyopadhyay (1992) investigate eight different environmental indicators for their responses to economic growth. These environmental indicators include SO_2, SPM, and per capita carbon emissions in atmosphere, dissolved oxygen and fecal coliform bacteria in rivers, municipal solid waste generation, annual rates of deforestation, and people's access to sanitation. Although their findings reveal four different forms of relationship between environmental quality and per capita GDP, the overall conclusion is consistent with the argument of IUC hypothesis.

Following the previous empirical studies, Lheem (2001) adds economic openness, industrial density, and the human capital factor into the model, attempting to provide further evidence to the relationships of environmental quality with economic growth and openness to trade, as well as human capital development. Economic openness is total trade (imports and exports) as a percentage of real per capita GDP in current (2000) US Dollars, while industrial density is calculated by manufacturing share as a percentage of GDP. This study also brings the index of manpower resource as an indicator of the human capital factor.[46] With this variable, Lheem hypothesizes that the more highly developed a civil society, the

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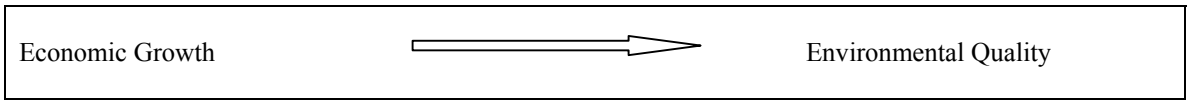
[44] Selden and Song explain that the large differences might be reasonable. First of all, Grossman and Krueger's income measure is national per capita GDP, not urban residents per capita income. Urban incomes are usually higher than the national average. It, therefore, could be downward biased on Grossman and Krueger's estimation. Second, air pollution in urban area is more harmful, more obvious than pollution in non-urban area, because of higher population density in urban area. The priority for pollution control may, accordingly, first be given to urban area. Finally, it would be relatively easier to reduce urban pollution than to reduce the total national pollution. For building higher smokestacks or rising urban land rents to force industry to locate in less populated area will improve urban environmental quality without changing the national level of pollution (Selden and Song 1994, 148-9).

[45] Unlike the estimations from Grossman and Krueger (1993; 1995) and Selden and Song (1994), the turning points in their results are too high to provide any empirical meanings (Holtz-Eakin and Selden 1992).

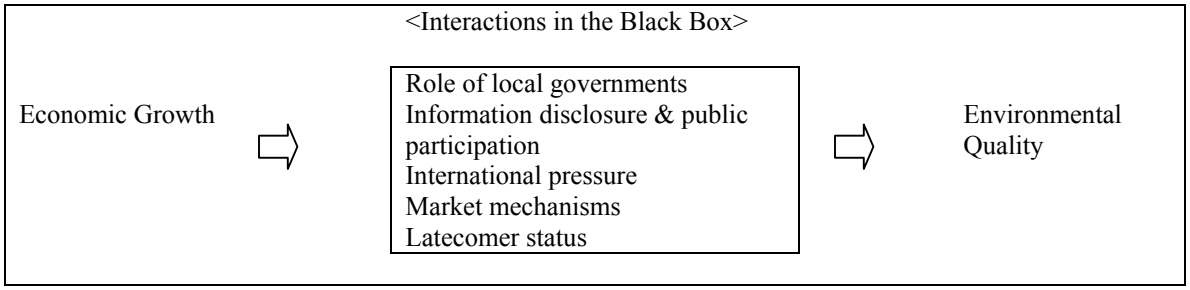
[46] The index was constructed by Vanhanen (1997). He constructed the IPR (index of power resources), which consists of the index of occupational diversification (IOD), the index of knowledge distribution (IKD), and index of the distribution of economic power resources (DER). It is assumed that the higher the value of IPR, the more widely socio-politically relevant power resources are usually distributed among

Table 3.2. Associations between Economic Growth and Environmental Quality

Simple economic-centric Model



Multidimensional Complexity of Economic-Environmental Nexus



Source: Grossman and Krueger (1993, 1995); Selden and Song (1994); Holtz-Eakin and Selden (1992, 1995); Shafik and Bandyopadhyay (1992); and Lheem (2001)

less pollution it emits. The main reason for adding the human capital factor into the model is that most economists tend to ignore a political impact on economic growth and environmental regulations. They also pay little attention to the possibility of indirect (and sometimes direct) influence of the maturity of civil society on environmental quality. As seen in Table 3.2, this suggests that the association between income and environmental degradation vary with the extent of political freedoms as well as development of civil society. The declining segment of the IUC may thus reflect the increase in political freedom and various attributes to civic society associated with higher income. In his equation of the multidimensional complexity of the economic-environmental nexus, he confirms an IUC relationship between per capita emissions of SO_2, NO_2, CO, and SPM and per capita GDP. Economic openness, however, shows different shaped-curves from the previous studies. While the relationship between overall emissions and economic openness is a U-shaped curve, the relationship between per capita emissions and economic openness is a cubic-shaped curve (Lheem 2001, 5).

In sum, as seen in Table 3.3, the IUC hypothesis argues that expanding economic activities do not necessarily harm the environment, while the LG hypothesis contends that expanding human economy should be associated with an increase in environmental degradation simply because of infinity of natural resources.

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various sections of the population and the more favorable social conditions are for not only democracy but also the maturity of civil society (Vanhanen 1997: 25-66).

Table 3.3. Summarization of LG and IUC Hypotheses

The Limits to Growth (LG) Hypothesis

Any specific natural resource is finite and therefore there are absolute limits on its use.

Definition of Sustainability (Sustainable Development):

- It is development, which meets the needs of the present without sacrificing the ability of the future to meet its needs (The Bruntland Commission 1987).
- It is development without growth: growth beyond the regenerative and adsorption capacities of the environment (Daly and Cobb 1989; Daly 1995).

In this context, economic development is differentiated from economic growth:

- Economic growth – increased use of materials and waste.
- Economic development – increased human welfare without increased use of materials or waste.

The Inverted U Curve (IUC) Hypothesis

Kuznets' IUC is adopted to explain the relationship between economic growth and environmental quality. Although environmental quality may worsen with economic growth in poor countries, it eventually improves with growth once countries become sufficiently rich.

Definition of economic growth:

- Economic growth (or expanding economic scale) refers to the monetary value of output (i.e., GDP), which is not directly related to material use or waste production.

In this context, economic growth and economic development can be exchangeable.

Next we turn from the primarily local nexus of economic growth and the environment to a consideration of global and international factors in domestic policy.

3. Globalization and International Factors

A body of literature emphasizes the importance of global eco-political factors to changes in domestic policies (Keohane and Nye 1977; Keohane 1986; 1989; Nye 1988; 1993; Vasquez 1995). This approach asserts that international factors encourage domestic government interest in positive environmental policy making in a number of ways. International actors help to increase knowledge about and concern over environmental problems. Also, international factors can offer incentives to states to participate in global eco-politics such as capital for environmental transformation or expert contacts that encourage domestic capacity building (Haas, Keohane and Levy 1993; Orbuch and Singer 1995; Keohane and Levy 1996; Rugman and Kirton 1998). In this section, I will survey the functions of globalization, global economic integration and the role of the United Nations in general, and the UN conferences on the environment in specific, as international factors of environmental sustainability in national-level analyses.

Globalization and Global Economic Integration

Before analyzing the competing prescriptions about the relationship between globalization and the degree of environmental sustainability, the term, globalization, needs to be defined and described. A short definition of globalization is the growing liberalization of international trade and investment, and the resulting increase in the integration of national economies into the global economy (Henderson 1999).[47] Although globalization has not been the result of some grand design imposed on the global economy, global economic integration is phenomenal and becoming established as a trend.[48] It has been an ad hoc, decentralized, bottom-up process accelerating from the collapse in the 1980s of both "global communism" and "the Third World romance" with import-substitution developmental strategies (Griswold 2000, 1). The fall of the Berlin Wall and the final disintegration of the Soviet empire released 400 million people from the grip of centrally commanded and essentially closed economic systems. Meanwhile, the debt crisis of 1982 and the resulting "Lost Decade" of the 1980s imposed a painful hangover on many Third World countries that had tried and failed to reach prosperity by shunning foreign capital and protecting and subsidizing domestic "infant" industries. Beginning with Chile in the mid-1970s and China later that decade, LDCs from Mexico and Argentina to India and Malaysia more recently have been opening their markets and welcoming foreign investment. The globalization of the last decade has not been the result of a "blind faith" in markets imposed from above but of "the utter exhaustion of any alternative vision" (Griswold 2000, 3-4). Consequently, global economic integration can be understood as the most critical barometer of the current trend of globalization (Delisle 2000).[49]

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[47] Henderson (1999) expands the definition into five related but distinct parts. First, there is increasing tendency for capitalists to think, plan, operate, and invest for the future with reference to markets and opportunities across the world as a whole. Second, this tendency necessarily results in growing ease and cheapness of international communications, with the Internet the leading aspect. Third, the trend tends towards closer international economic integration, resulting in the diminished importance of political boundaries. This trend is fueled partly by the first two trends, but even more powerfully by official policies aimed at trade and investment liberalization. Fourth, there is apparently growing significance of issues and problems extending beyond national boundaries and the resulting impetus to deal with them through some form of internationally concerted action. And last, the tendency goes towards uniformity, or harmonization, by which norms, standards, rules, and practices are defined and enforced with respect to regions, or the world as a whole, rather than within the bounds of national states.

[48] In fact, the modern "global economic integration" era started with the fateful meetings at Bretton Woods, New Hampshire, in July 1944. That was when the world's leading economists and politicians got together to figure out how to mitigate the devastation of World War II. They decided that a new global economic system was required to promote global economic development. This would lead away from wars, they thought, and would help the poor and the rebuilding process. After the Bretton Woods meetings, many international institutions were developed. They are the World Bank, the International Monetary Fund (IMF, with other names at that time), and then the General Agreement on Tariffs and Trade (GATT), which later gave birth to the World Trade Organization (WTO). Later clones of the model included North American Free Trade Agreement (NAFTA), the Maastricht Agreement in Europe (European Union, EU) , Asia-Pacific Economic Cooperation (APEC), Association of Southeast Asian Nations (ASEAN), the upcoming Free Trade Area of the Americas Agreement.

[49] Now, global exports as a share of global domestic product have increased from 14 percent in 1970 to 24 percent today, and the growth of trade has consistently outpaced growth in global output. In the United

Furthermore, along with this tendency of globalization, (characterizing global economic integration and economic interdependence on trade, finance, direct investment), educational, technological, ideological, and cultural, as well as ecological, environmental, legal, military, strategic, and political impulses are now rapidly propagated throughout the world. Money and goods, images and people, information and ideas, sports and religions, guns and drugs, and diseases and pollution can now be moved quickly across national frontiers. When the global satellite communications system was established, instantaneous communication from any part of the world to any other became possible. It is not only the creation of a 24-hour money market that became possible but also the flashing of pictures of statesmen and film stars across the globe, making these faces more familiar to us than those of our next-door neighbors.

International Trades and the Environment

Among many preposterous claims, advocates of globalization argue that global economic integration and international trades increase long-term environmental protection.[50] After the failure of the 1999 WTO Ministerial Conference in Seattle, few topics appear to be more important than the relationship between international trade and the environment. With international trade increasingly revolving around large economic blocs such as NAFTA, the EU, APEC, MERCOSUR, and ASEAN, the relationship between the environment and economic integration in a broad sense, including all forms of regional trade liberalization, has become a focal point of interest. At the same time, few issues are as complex and multifaceted as this one. Does economic integration cause environmental deterioration? Does free trade really induce a downward competition of environmental standards?

The considerable quantity of literature dealing with this issue tends to adopt one of two traditional approaches. The first type of literature offers a political approach to environmental policy, investigating to what extent environmental policy can be shaped and abused by interest groups for protectionist purposes. It is worth emphasizing that, unlike environmental economics, which argues about what should be an optimal environmental policy from the perspective of economic efficiency, this segment of the literature adopts a public choice perspective. For that reason, it provides illuminating insights into the origins of diverging environmental policies. It also explains why interest groups are so committed to influencing environmental

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States, the ratio of two-way trade and investment income flows as a share of GDP has roughly tripled since the 1960s. Annual global flows of foreign direct investment surged to a record $400 billion in 1997, with 37 percent directed to LDCs, up from 17 percent in 1990 (Greenspan 1999; UN World Investment Report 1998, 9; UN Human Development Report 1999, 25). In the 1970s, daily foreign exchange transactions averaged about $10 billion; today, the average daily activity has reached more than $1.5 trillion (OECD 1999, 45).

[50] In this vein, advocates of globalization for environmental protection fortified with neoclassical economics prescribe in the same path as the environmental positivists of the IUC hypothesis. The simple logical line is: although environmental sustainability may worsen with expanding human economy, it eventually improves with material wealth, advanced technologies, and interdependence with other countries (Grossman and Krueger 1995, 353-4; 376-7).

policies in spite of the fact that at the macroeconomic level neither empirical analyses nor model-based predictions show a clear impact of environmental policies on trade flows or direct investment choices.

A second body of literature analyzes the consequences of trade on the environment through changes in production and consumption patterns as well as through the impact of trade on national economic growth rates in general. Environmental policy in these analyses is viewed as a given. From this perspective, economic integration can, in some cases, benefit the environment. Trade liberalization may, for instance, reduce market failures, which are responsible for inefficient allocation of scarce resources and, therefore, for wasting environmental resources. Trade liberalization can also facilitate the diffusion of "greener" technologies. In other cases, economic liberalization can trigger a reaction to "environmental dumping" through the systematic exploitation of comparative advantages based not on an intrinsically higher efficiency of the economic system, but rather on the externalization of environmental costs allowed by current environmental regulations.

Although independently helpful, these two approaches can be usefully integrated. Bommer (1998) offers a bridge between these approaches. According to him, the missing link is found in the answer to the question: how does trade liberalization trigger a reformulation of national environmental policies? To give an answer, Bommer looks at both the consequences of trade liberalization on the environment, and at how the environmental policy-making process reacts to the environmental consequences of trade liberalization. His approach constitutes an attempt to combine the two traditional bodies of literature in order to investigate the effect of economic integration on environmental policymaking. This study explains how economic integration affects the stakes of the interest groups that, in turn, influence environmental policy, and at the same time how environmental policy is changed in the process of economic integration. It is often said that environmental policies are still mainly national and also somewhat flexible, unlike trade policies that are multilateral (WTO) or regional (NAFTA) and more stable.

Considering that environmental policy basically derives from the interaction between three groups of rational actors (the state, producers, and environmental organizations), Bommer's dynamic analysis, largely model-based, offers differentiated answers regarding the overall impact of trade liberalization on the environment. In particular, depending on the relative strengths of the interest groups and on the nature of the international economy (perfect competition, imperfect competition, and asymmetric information), the impact of trade liberalization can vary widely.

In one example, Bommer combines a simple general equilibrium model with a model of endogenous environmental regulation, assuming a situation of perfect competition. Whereas trade liberalization may increase environmental disruptions in the short term, its impact on stakeholders' attitudes may later trigger a tightening of environmental standards. For instance, if the export sector that benefits from trade liberalization is a larger polluter than the import sector, a tightening of environmental regulations could, in the next stage, reverse or mitigate the initial damages. In this view, this scenario corresponds quite well to the impact of NAFTA on the United States. In a second example, Bommer offers

an original modeling of the European policy formulation process in a situation of imperfect competition. His conclusion is stimulating with regard to the issue of regional and global environmental governance. A European environmental policy, named the European pollution standard, can prevent politicians from lowering national pollution standards, as they would feel tempted to in the sole presence of the single market.

The United Nations Conferences on the Environment

UN conferences contribute to governance and sustainable development by establishing and reinforcing some of constructivist themes in international relations.[51] Although international conferences seldom have direct causal influences on member states' behavior, their outputs are part and parcel of the broader process of multilateral cooperation and may contribute to stronger and more effective environmental attitudes and policies by states. Accumulated global environmental conferences over the last thirty years have contributed to an aggregate shift in international politics by extending participation and access to environmental diplomacy to national environmental agencies, NGOs and networks of scientists, forming a "large-scale process of social mobilization" (Fomerand 1996, 364). Over the last thirty years, governments have added the inspirational norm of ecological integrity to the traditional goals of wealth and power.

Global UN conferences on the environment are widely understood as an institutional innovation of the 1970s. With mounting concern about the degradation of the physical environment, governments approached the UN to convene a number of global conferences to address the host of human activities with transboundary and global environmental consequences. These environmental conferences became part of a broader effort at global problem solving that addressed a new class of challenges associated with international interdependence and economic integration. As global interdependence became increasingly politicized in the 1970s, the UN system turned to global conferences to highlight the interconnections between issues that had previously been treated in isolation. The topics of the global conferences were new to the international agenda, whereas previous multilateral conferences had principally addressed issues of international economics, human rights, and arms control (Kaufmann 1988; Willetts 1989). The UN, as the only venue with global participation, was the logical forum for such meetings. These global conferences

[51] Constructivism of IR literature has been focusing on the institutional, discursive, and intersubjective procedures by which international governance develops. Ruggie writes, "Social constructivism rests on an irreducibly intersubjective dimension of human action." Constructivism is about "human consciousness and its role" in international life. Constructivists hold the view that "the building blocks of international reality are ideational as well as material; that ideational factors have normative as well as instrumental dimensions; that they express not only individual but also collective intentionality; and that the meaning and significance of ideational factors are not independent of time and place" (Ruggie 1998, 856, 879). Constructivists look at the mechanisms and consequences by which actors, particularly states, derive meaning from a complex world, and how they identify their interests and policies for issues that appear new and uncertain.

performed multiple functions. They were intended to mobilize concern about new problems, to coordinate national actions to study and monitor environmental quality and human activities with environmental consequences, and to develop joint measures to prevent various sources of environmental degradation and attenuate the effects of human actions on the environment.[52]

The 1972 UN Conference on Human Environment (UNCHE) and the 1992 UN Conference on Environment and Development (UNCED) directly addressed the subject of environmental protection, but special UN conferences devoted to different aspects of human impact on the environment became commonplace in the 1970s. The frequency of such global conferences diminished in the 1980s and 1990s. What has remained constant are the decadal meetings of conferences on population, women, and food, as well as the follow-up annual reviews on UNCED commitments and the more comprehensive and high-profile UNCED+5 meeting in 1997 and the UNCED+10 meeting in 2002.[53] Table 3.4 presents a full list of UN global environmental conferences.

The 1972 UNCHE, held in Sweden, was the first major global environmental conference. Sponsored by the UN, it convened 113 countries to discuss contemporary environmental issues. UNCHE adopted the Stockholm Declaration, establishing twenty-six principles of behavior and responsibility to serve as the basis for future legally binding multilateral accords; and the Action Plan for the Human Environment that specified 109 recommendations in the areas of environmental assessment, environmental management, and supporting institutional measures (Haas 2002). Implementation was intended for governments and international organizations (IOs).

The 1992 UNCED, held in Rio de Janeiro, marks a significant step toward global environmental consensus. UNCED adopted the Framework Convention on Climate Change, the Convention on Biological Diversity, and the Statement of Forest Principles. In addition to those three pieces of hard law, UNCED adopted the Rio Declaration, with 287 principles of guiding action, and Agenda 21, a sweeping action plan to promote sustainability, with 2,509 specific recommendations applying to states, international institutions, and members of civil society. The Commission on Sustainable Development was created to ensure effective follow-up of UNCED, to enhance international cooperation and rationalize intergovernmental

[52] Preceding a conferences, though, are often several rounds of ad hoc Preparatory Committee sessions, so called "Prep Coms," often spread over one to two years, at which national delegations are presented with background papers and preliminary negotiations are conducted on the documents intended for approval at the conference. Most of the arduous work of reconciling political differences occurs during the Preparatory Committee sessions.

[53] Generally the global UN conferences on the environment have produced declarations and action plans for subsequent activities. The most influential conferences endorsed new policy doctrines and policy targets for the international community, authorized the creation of new international organizations, approved legal commitments, and generated new financial resources. The most productive, in terms of their administrative accomplishments, have been 1972 UNCHE, the 1974 World Food Conference, 1992 UNCED, and the 1994 International Conference on Population and Development (Weiss and Jordan 1976; Caldwell 1996). Others, such as the 1977 Conference on Desertification, the 1979 Conference on Science and Technology for Development, and the Conferences on Human Settlements, have failed to spark international concern or to catalyze robust international commitments and action.

Table 3.4. Summarization of Global Environmental and Sustainable Conferences Since 1972

Year	Name/Location	Product/Outcome
1972	UN Conference on the Human Environment (UNCHE), Stockholm	Declaration of Principles, UNEP
1974	World Food Conference, Rome	Universal Declaration on the Eradication of Hunger and Malnutrition, World Food Council, IFAD
1974	World Population Conference, Bucharest	World Population Plan of Action
1975	World Conference on Women	
1977	UN Water Conference, Mar del Plata, Argentina	International Drinking Water Supply and Sanitation Decade (1981-1991)
1977	UN Conference on Desertification, Nairobi	Plan of Action to Combat Desertification
1978	UN Conference on Human Settlements, Vancouver	UN Centre for Human Settlements, Global Strategy for Shelter to the Year 2000
1979	UN Conference on Science and Technology for Development, Vienna	Vienna Programme of Action on Science and Technology for Development
1979	World Climate Conference, Geneva	
1981	UN Conference on New and Renewable Sources of Energy, Nairobi	Nairobi Programme of Action for the Development and Utilization of New and Renewable Sources of Energy
1984	World Conference on Agrarian Reform and Rural Development, Rome	Programme of Action on Agrarian Reform and Rural Development
1984	Second World Population Conference, Mexico City	
1985	World Conference on Women	
1990	Second World Climate Conference, Geneva	Intergovernmental Panel on Climate Change (IPCC)
1992	The UN Conference on Environment and Development (UNCED), Rio de Janeiro	Rio Declaration Agenda 21 Framework Convention on Climate Change Convention on Biodiversity Statement of Forest Principles UN Commission on Sustainable Development
1994	International Conference on Population and Development, Cairo	Programme of Action

Table 3.4. Summarization of Global Environmental and Sustainable Conferences Since 1972 (Continued)

Year	Name/Location	Product/Outcome
1995	Fourth World Conference on Women, Beijing	Beijing Declaration and Platform of Action
1996	Habitat II, Istanbul	The Habitat Agenda and Istanbul Declaration on Human Settlements
1996	World Food Summit, Rome	Rome Declaration on World Food Security and the World Food Summit Plan of Action
1997	UNGA Special Session on Sustainable Development	
2002	UNCED, South Africa	The Review of the implementation of Agenda 21

Source: Formerand (1996); Weiss, Forsythe and Coate (1997); Caldwell (1996); Haas (2002).

decisionmaking capacity, and to examine progress in Agenda 21 implementation at the local, national, regional, and international levels (Grubb, *et al*. 1993).

The aggregation of UN conferences has been to create a diffuse array of pressures on states militating for forms of sustainable development. Rio+10 provided opportunity for reforming and streamlining multilateral environmental governance. It is intended to refocus international attention on sustainable development and to assess accomplishments since 1992. It, however, lacks most of the properties of conferences that led to productive outputs that contributed to improved international environmental governance. Rio+5 was widely regarded as a failure in this regard, as it did not mobilize any long-standing interest. Mass public interest in sustainable development remains weak, and the United States appears to be developing a new global diplomatic posture of skeptical multilateralism, at best, as seen by the abandonment of the Kyoto Protocol and the Anti-Ballistic Missile (ABM) Treaty (Haas 2002). Consequently, there is little political impulse for a productive conference. Multilateral financial and technological transfers for sustainable development have dwindled since the early 1990s. Moreover, there is growing disenchantment with UN Environment Programme's (UNEP) remote location in Kenya and its lack of resources. The Commission for Sustainable Development lacks the administrative autonomy or financial resources to be able to reach out to civil society to develop any of the conference functions discussed above that could potentially influence state policies and environmental quality. States also appear increasingly concerned about controlling NGO participation at the meetings.

The best prospects for products from the Rio+10 are probably institutional reforms. The international environmental governance system has not been significantly overhauled in three decades. After UNCHE, UNEP was the only international institution responsible for environmental protection. Since

then, however, most international institutions have assumed some environmental responsibilities. Recent evaluations suggest that there are administrative overlaps in the system and inefficiencies, as institutions have assumed new responsibilities for the environment. Suggestions for improvements focus on reforming UNEP and on creating a Global Environmental Organization (GEO), which can serve as a legal advocate for environmental protection and regulations to counterbalance the World Trade Organization (WTO) by collecting a roster of international environmental lawyers to participate in WTO panels.

In sum, UN environmental conferences have helped contribute to a broader shift in international environmental governance through educating governmental elites, exposing them to new agendas and discourses, and providing them with added resources to pursue sustainable development. While the political preconditions appear modest for any dramatic achievements and cognitive transformations at Rio+10, we must remember that the conference is part of a thirty-year-long era of multilateral environmental protection. The conference can continue to legitimate the participation of NGOs and scientists in international environmental governance, improve contact between civil society and states, and streamline institutional responsibilities within the UN and Bretton Woods systems for sustainable development. Even in the absence of strong political support by member governments for significant multilateral commitments, progressive governments and other conference participants can still press for reforms to existing arrangements that will ensure more national reporting on their movement toward sustainable development, create information clearinghouses about green technologies, and endow UNEP, a new GEO, or another international institution with verification authority to monitor international movement toward sustainable development.

4. Summary

In this chapter we discussed the impacts of democratic, economic, and international factors on the degree of environmental sustainability and surveyed competing arguments of their relationships. Although recent studies have shown democracy is positively associated with better environmental sustainability, the historical record of ecological destruction in democracies does not inspire much confidence in their ability to protect the environment. The debates about influences of economic growth and globalization in terms of global trade integration to environmental sustainability are also complex, controversial and inconclusive. In addition, this chapter delineated a brief summarization of the U.N. conferences on the environment and suggested reinforcing existing global environmental programs such as UNEP and creating another international environmental institution (e.g., GEO). In the next chapter, we will discuss research design, variables and their measurement, statistical estimation problems and diagnostic tests of the variables.[54]

[54] However, since the roles of the U.N. environmental conferences are beyond the scope of this study, the proposed environmental model does not hypothesize them in empirical analyses of the next chapter.

Chapter Four. Research Design and Measurement

This chapter consists of a discussion of the data and method used. It reviews conceptual and operational definitions of variables and discusses the criteria of sample selection and the logic of cross-national analyses. In addition, the problems of parameter estimates in empirical studies and diagnostic tests of the data are analyzed and reported.

1. Sample Selection

The countries in this research are drawn from the political units in the United Nations Development Programme (UNDP)'s *Human Development Index, 2001* and the World Bank's *World Development Indicators, 1997 to 2000*. Of the 162 political units (from UNDP's category) and 147 political units, excepting countries with less than one million of population (from the World Bank), some political units lacked data on one or both the dependent and independent variables. Accordingly, the analysis is based on the remaining 122 political units, listed in Appendix 1, during the time frame from 1997 to 2000. The criteria for the sample selection are based on the subject of the research and the availability of data and information. The classification of countries into regional groups is to some extent arbitrary because there is no stable and universally accepted way to divide countries into continental, cultural, or other regional groups. However, in order to analyze the environmental sustainable models on the basis of a regional dynamic analysis, the countries selected in this study are divided into six regional-economic groups based on geographical, cultural and economic differences (i.e., Asia; Latin America and the Caribbean; the Middle East and North Africa; Sub-Saharan Africa; East and Central Europe; and the OECD).[55] The Middle East and North Africa constitute a heterogeneous group of countries, but they are geographically connected with each other and they are culturally united by Islam. However, because Turkey has close political and military connections to European countries, this study puts it in this category because of historical, cultural, and geographical reasons. As long as Papua New Guinea does not hurt the whole frame of empirical estimation, it is in the Asian category for technical simplification.

2. Cross-National Analysis

Cross-national analyses have been subjected to a number of criticisms (Rostow 1968; O'Donnell 1973; 1978; Ravenhill 1980; Ragin 1987; Rueschemeyer 1991; Rueschemeyer, et al. 1992). These criticisms mainly focus on three issues: over-simplification, demonstration of causality, and the existence and treatment of deviant cases. Critics argue that cross-national analyses pay insufficient attention to the historical genesis and context of the social phenomena that they study. Cross-national analyses simplify and reduce the complexity of the countries being studied to clusters of aggregate information called variables so they can subject them to statistical analysis and manipulation. In effect, much of the detail of specific countries is lost in a statistical haze that leaves one with little understanding of the actual social processes

[55] Countries in the six groups are not necessarily mutually exclusive.

operating in individual countries. Critics also contend that efforts to develop causal connections between variables are difficult, if not impossible. Rostow minces no words on the matter when he states: "the tally-ho method of political research" is imperfect because "correlation between contemporary social, economic, and political indicators for a series of countries give no clues whatever as to the direction, if any, of causality" (Rostow 1968, 48). O'Donnell and Ragin argue that cross-national research is based on non-experimental designs that deviate substantially from the preconditions such problems as the time ordering of variables and the ruling out spurious and confounding variables for demonstrating causality (O'Donnell 1973; 1978; Ragin 1989). Furthermore, Ravenhill states the matter in no uncertain terms when he observes that "for students of comparative politics, it is the exceptional performance that merits attention, whereas for those who employ aggregate cross-national analysis the deviant case is a nuisance to be discounted or even excluded because of its tendency to bias sample means" (Ravenhill 1980, 120). O'Donnell also adds that the dismissal of deviant cases makes hypotheses difficult or impossible to falsify.

The criticism that cross-national research oversimplifies reality and misses important social processes is true at a certain level. It is, however, based on the mistaken idea that we either cannot or should not develop generalizations about social regularities that transcend place and time. Przworski and Teune argue that social science research should and can lead to a general statement about social phenomena. This assumption implies that human behavior can be explained in terms of general laws established by observation. Likewise, this presupposition is extremely important in the comparative social inquiry if we believe that different systems can be compared and generalizations can be made (Przeworski and Teune 1970, 4).[56] Indeed, cross-national comparisons have flourished over the past four decades. Comparisons of East Asia with Latin America have been especially illuminating for understanding the causes and consequences of varying development strategies (Evans 1987; 1989; Haggard 1990; Gereffi 1983). Other comparisons between Latin America and Europe, either industrial or developing, have been revealing in part because the point of departure has been convergence rather than contrast.

Furthermore, there are two other ways to defend cross-national analyses. First, generalization and prediction do not necessarily imply or require a deterministic model. Probabilistic models of the form *as X increases/decreases the more/less likely is Y* are appropriate for most phenomena that social scientists study. That is because one exception, or even several exceptions, does not necessarily disprove the probabilistic theory on which they are based. Validity is judged by how well the theory accounts for the general patterns in the data and whether or not another theory exists that provides a better account (Liegerson 1991). Second, what is being generalized and predicted? Theoretical generalization and prediction are distinct from a complete explanation. By definition, complete explanations are historical since they only apply to a single, unique instance. On the other hand, theoretical explanations, on which

[56] These scholars have a famous fruit analogy. They essentially argue that one can compare qualitatively different entities such as oranges and apples, which are both fruit; both have skin, both have juice, both have seeds, etc.

generalization and prediction are based, identify essential features that are expected to be highly correlated in the population of cases. Although no theory can generalize, predict, or even explain anything completely (Lieberson 1992; Cohen, B. 1989), it is crucial to clarify to what extent social phenomena can be generalized or explained.

3. Variables and Hypotheses.

Dogan says: "Chariot of science is trailed by three horses: theory, data, and method. If the three horses do not run at the same speed, the chariot may lose its equilibrium" (Dogan 1994, 35). According to his observations, there is, in the field of comparative politics, a serious gap between substance and method, particularly in the arena of quantitative research. Therefore, in order to conduct a proper research, empirical studies need to select sound concepts for presenting peculiar social phenomena, to carefully define those concepts, to have accurate operational definitions, and then to provide proper quantifying indicators. Manheim and Rich also argue that quantitative research should operationalize central theoretical concepts into empirical indicators, gather quantitative data on these indicators, and provide probabilistic causal explanations to social phenomena (Manheim and Rich 1986, 15-30, 43-67). The quantification of dependent, independent and control variables make it possible to use various statistical methods of analysis.[57]

Furthermore, to reduce the vagueness about the causal inference in social science, independent variables have to satisfy certain assumptions of causality. David Hume (1748; 1910) states that a category of relation is causality and dependence (i.e., cause and effect).[58] It is said to be a function of the hypothetical form of judgment. According to Hume, a substance is capable of alteration that is successively, in time, having accidents, which are incompatible with each other. The substance at one time is in one state and at another time is in a different state. The subsequent state is called an effect when the transition from its previous state is lawful. To be lawful, the transition to the new state must be a necessary consequence of the initial state of the substance and, perhaps, the states of other substances as well. The sum of the states necessary to bring about the effect is the cause. The action of the cause, that is, the bringing about of the effect, is called the causality of the cause. The occurrence of the effect, which is brought about by the cause, is the dependence of the effect. Additionally, being aware of the criteria of

[57] In order to conduct proper quantitative research, SPSS 11, SAS v8, and JMP5 versions of statistic software packages are used for reasons of parsimony, accuracy, relevancy, and simplicity. After all, statistical techniques are highly related to the nature of data.

[58] Hume is most often cited as a radical empiricist whose reflections on the nature of knowledge led him to a skeptical stance in regard to our knowledge of the external world and the Law of Causality. According to him, there are four criteria of causality: they are constant conjunction, contiguity, antecedence, and necessary conjunction. The necessary conjunction is the main criterion, which implies that in order to know x causes y, one must eliminate other possible variables that may cause y. However, in reality, the four criteria are not usually satisfied so that most cross-national analyses can only conduct probabilistic causal explanation.

Hume's causality, this study follows Popper's notion of falsification in terms of methodology.[59] The proposed hypotheses are tested by empirical evidence to see to what extent they are able to explain environmental sustainability. The hypotheses are predictions derived from the various theories of environmentalism. They are falsifiable statements, and this study's intention is to see to what extent empirical evidence contradicts them. In other words, to what extent they agree with the facts. With the research frame adopted in this study, it is possible and inevitable to falsify, as well as to verify the proposed hypotheses by empirical observations and evidences.

4. Dependent Variable: Environmental Sustainability

The dependent variable in this study is environmental sustainability and is quantified by applying environmental sustainability index formatted by WYC (2001). Although there are a number of well-known definitions of environmental sustainability (WCED 1987; Goodland, *et. al*. 1991; World Bank 1992; Daly and Cobb 1993; WCU 1993; Daly 1996), this study contends that environmental sustainability can be presented as a function of five phenomena: (1) the state of the environmental systems, such as air, soil, ecosystems, and water; (2) the stresses on those systems, in the form of pollution and exploitation levels; (3) the human vulnerability to environmental change in the form of loss of food resources or exposure to environmental diseases; (4) the social and institutional capacity to cope with environmental challenges; and finally (5) the ability to respond to the demands of global stewardship by cooperating in collective efforts to conserve international environmental resources such as atmosphere. In sum, the dependent variable here is defined as the ability to produce high levels of performance on each of these five dimensions in a lasting manner (see Table 1.3 in Chapter One). The empirical indicator of environmental sustainability in this study adopts the Environmental Sustainability Index (ESI) composed by WYC (2001), which presented a full set of 22 indicators for environmental sustainability (see Table 1.4 in Chapter One).[60] The indicators

[59] Popper's most important contribution to philosophy of science was to demonstrate the impossibility of verifying a general law (Popper 1983). Science proceeds by falsification, not by verification as behavioralists argue. Popper repudiates induction, rejects the view that it is the characteristic method of scientific investigation and inference, and substitutes falsifiability in its place. It is easy, he argues, to obtain evidence in favor of virtually any theory, and he consequently holds that such 'corroboration,' as he terms it, should count scientifically only if it is the positive result of a genuinely 'risky' prediction, which might conceivably have been false. For Popper, a theory is scientific only if it is refutable by a conceivable event. Every genuine test of a scientific theory, then, is logically an attempt to refute or to falsify it, and one genuine counter-instance falsifies the whole theory. In a critical sense, Popper's theory of demarcation is based upon his perception of the logical asymmetry which holds between verification and falsification: it is logically impossible to conclusively verify a universal proposition by reference to experience (as Hume saw clearly), but a single counter-instance conclusively falsifies the corresponding universal law. In a word, an exception, far from proving a rule, conclusively refutes it. Scientists form hypotheses or make guesses about the world, state them in such a way that it is clear under what conditions they might be false, and then set out to falsify them. Successful falsification leads to the generation of new guesses or hypotheses and therefore more attempts at falsification. And so science proceeds.

[60] The Index eliminated all countries for which the data were insufficient to generate measures for at least 19 of the 22 indicators. It included all countries for which the data permitted measurements of at least 20

and variables were chosen through careful review of the environmental literature and available data combined with extensive consultation and analysis. They are finally substantiated by statistical analysis and reasoning.[61] For instance, covering the 22 indicators had an average bivariate correlation among themselves of 0.11. Only 36 out of the 231 possible pairs of indicators had correlation coefficients greater than 0.5. The highest such correlations are reported in Table 4.1.[62] This data set also determined which individual variables had the highest correlation with the ESI and reports those in Table 4.2.

Table 4.1. Most Highly Correlated Indicator Pairs

		Correlation Coefficient
Basic Human Sustenance	Environmental Health	0.85
Environmental Health	Reducing Population Stress	0.82
Basic Human Sustenance	Reducing Population Stress	0.72
Environmental Health	Science / Technology	0.69
Science / Technology	Eco-efficiency	0.68
Science / Technology	Reducing Public Choice Distortions	0.66
Basic Human Sustenance	Science / Technology	0.66
Reducing Population Stress	Science / Technology	0.63
International Commitment	Private Sector Responsiveness	0.63
International Commitment	Eco-efficiency	0.62
Water Quality	Science / Technology	0.61
Regulation and Management	International Commitment	0.60
Reducing Public Choice Distortions	Eco-efficiency	0.60
Basic Human Sustenance	Protecting International Commons	-0.60
Reducing Air Pollution	Science / Technology	-0.63

indicators (94 countries). For those countries where the data permitted measurements of no more than 19 indicators (54 countries), it applied an additional criterion: if their overall data coverage included at least as many variables as the lowest number for countries missing two indicators, it included them in the index (28 countries met this criterion). It ended up with 122 countries in the Index, each of which has data for at least 62 % of the variables in its analysis. Where it had a sound analytical basis for doing so, it estimated missing values. In total, it estimated just over 60 percent of the missing variables, using a variety of computer formulations and equations (WYC 2001, 8-10).

[61] If the variables serving as measures of the indicators were empirically related, then they ought to be more highly correlated with each other than the average pair of variables in the overall data set. This turns out to be true. The average bivariate correlation for variable pairs within the same indicator is 0.36, whereas it is 0.09 for the data set as a whole (WYC 2001, 13).

[62] In conventional rules, less than 0.8 of correlation value is acceptable. Although there are two pairs of indicators out of the 231 possible combinations above the acceptable level, the set of data is considered as highly acceptable with statistical significance. This provides confirmation that the set of data is successfully formulated as analytical categories that are capable to measuring distinct aspects of environmental sustainability.

Table 4.2. Variables with Highest Correlation to ESI

Variable	Correlation Coefficient	N
Reducing Corruption	0.75	122
Environmental Regulatory Stringency	0.74	56
Scientific and Technical Articles Per Million Population	0.73	122
Average Innovest EcoValue 21 Rating of Firms	0.71	20
Urban TSP Concentration	0.70	122

The fact that Reducing Corruption (0.75) is the variable that has the highest correlation with the ESI supports the view that good governance broadly conceived enhances environmental sustainability. However, the significance of the high correlation coefficient for the Innovest Eco Value rating (0.71), which measures the quality of environmental management within firms, is diminished somewhat by the low number of countries for which that variable is available. It is noteworthy, however, that overall the Eco Value rating is the second most highly correlated variable with the Environmental System component. Among these 20 countries at least, it appears that good environmental management at the firm level is associated with environmental performance at the broader national level.

The Index also shows whether the measure of environmental sustainability was highly correlated with other phenomena or measures. The results are presented in Table 4.3. Although the relationship with GDP per capita is strong (0.76), other global indices, such as the Consumption Pressure Index (0.56) and the Ecological Footprint (0.6), show higher correlations with per capita income. The factors that are not strongly correlated with the ESI are equally interesting. Population density and economic growth rates, in spite of common complaints about their impacts on the environment, are in general not consistently associated with poor environmental performance. These results suggest that countries that are growing quickly need not degrade their environments, nor are densely populated countries doomed to pollution damage and natural resource shortages.

In short, these indicators are deemed the most relevant constitutive elements of the five core components and are the central elements of analysis for constructing an operational definition of environmental sustainability. Each of the indicators, in turn, is associated with a number of variables that are empirically measured. The relationship between these Index building blocks is specified in Table 4.4. Finally, this Index provides that the large amount of information contained in the data set of environmental sustainability is capable of being utilized for a variety of other purposes. For example, it could serve as the basis of a watch list of countries facing potential environmental-driven crises.

Table 4.3. Correlations Between ESI and Other Comparative Measures

	Correlation with ESI
WWF Consumption Pressure Index	0.56**
Ecological Footprint	0.60**
Percent of GDP from agriculture	-0.48**
GDP per capita (PPP)	0.76**
1990-1998 GDP per capita growth	0.12
Human Development Index	0.67**
Population Density	-0.06
Percent of territory with population density greater than 5 persons per square km.	-0.19*
WEF Current Competitiveness Index	0.65**

** = < 0.01 (2-tailed).
* = < 0.05 (2-tailed).

Table 4.4. Environmental Sustainability Index Building Blocks

Component	Indicator	Variable
Environmental Systems	Air Quality	Urban SO_2 concentration
		Urban NO_2 concentration
		Urban TSP concentration
	Water Quantity	Internal renewable water per capita
		Water inflow from other countries per capita
	Water Quality	Dissolved oxygen concentration
		Phosphorus concentration
		Suspended solids
		Electrical conductivity
	Biodiversity	Percentage of mammals threatened
		Percentage of breeding birds threatened
	Terrestrial Systems	Severity of human induced soil degradation
		Land area affected by human activities as a % of total land area
Reducing Stress	Reducing Air Pollution	NO_x emissions per populated land area
		SO_2 emissions per populated land area
		VOCs emissions per populated land area
		Coal consumption per populated land area
		Vehicles per populated land area
	Reducing Water Stress	Fertilizer consumption per hectare of arable land
		Pesticide use per hectare of crop land
		Industrial organic pollutants per available fresh water
		Percentage of country's territory under severe water stress
	Reducing Ecosystem Stress	Percentage change in forest cover 1990-1995
		Percentage of country's territory in acidification exceedence
	Reducing Waster & Consumption Pressures	Consumption pressure per capita
		Radioactive waster
	Reducing Population Pressure	Total fertility rate
		% change in projected population between 2000 & 2050
Reducing Human Vulnerability	Basic Human Sustenance	Daily per capita calorie supply as a % of total requirements
		% of population with access to improved drinking water supply
	Environmental Health	Child death rate from respiratory diseases
		Death rate from intestinal infectious diseases
		Under 5 mortality rate

Continued on next page.

Table 4.4. Environmental Sustainability Index Building Blocks (Continued).

Component	Indicator	Variable
Social and Institutional Capacity	Science / Technology	R & D scientists and engineers per million population
		Expenditure for R & D as a percentage of GNP
		Scientific and technical articles per million population
	Capacity for Debate	IUCN member organizations per million population
		Civil and political liberties
	Regulation and Management	Stringency and consistency of environmental regulations
		Degree to which environmental regulations promote innovation
		Percentage of land area under protected status
		Number of sectoral EIA guidelines
	Private Sector Responsiveness	Number of ISO 14001 certified companies per million dollars GDP
		Dow Jones Sustainability Group Index membership
		Average Innovest EcoValue 21 rating of firms
		World Business Council for Sustainable Development members
		Levels of environmental competitiveness
	Environmental Information	Availability of sustainable development information at the national level
		Environmental strategies and action plans
		Number of ESI variables missing from selected data sets
	Eco-Efficiency	Energy efficiency (total energy consumption per unit GDP)
		Renewable energy product as a % of total energy consumption
	Reducing Public Choice Distortions	Price of premium gasoline
		Subsides fro energy or materials usage
		Reducing corruption
Global Stewardship	International Commitment	Number of memberships in environmental intergovernmental organizations
		Percentage of CITES reporting requirements met
		Levels of participation in the Vienna Convention / Montreal Protocol
		Compliance with environmental agreements
	Global-Scale Funding & Participation	Montreal Protocol Multilateral Fund participation
		Global Environmental Facility participation
	Protecting International Commons	FSC accredited forest area as a % of total forest area
		Ecological footprint "deficit"
		CO_2 emission (total times per capita)
		Historic cumulative CO_2 emissions
		CFC consumption (total times per capita)
		SO_2 exports

Source: 2001 Environmental Sustainability Index (WYC 2001, 10-1)

5. Independent Variables

The conceptual definitions and operational measurements of five independent variables (quality of governance, democracy, economic growth, global economic integration as a major form of globalization and population growth rate) are analyzed in this section.

Quality of Governance.

In recent years, the growing interest of academics and policymakers in governance has been reflected in the proliferation of cross-country indices measuring various aspects of governance. Several recent innovative studies have attempted to quantify the quality of governance and its contribution to sustainable development (Mauro 1995; Ades and DiTella 1996; Wei 1997; Rodrik 1997; Johnson, Kaufmann and Zoido-Lobaton 1999; 2000). However, to arrive at concrete policy recommendations for using the concept of governance as a development tool, more comparative research is required that uses precise measures of governance to examine within-country and across-country variations in poverty reduction, government performance, ethnic conflict, social integration, corruption control, economic growth, and environmental protection.

Assuming that available indicators shed light on a fairly small number of broad concepts of governance, Kaufmann, Kraay, and Zoido-Lobaton provide six measurable indicators (accountability, political stability, government effectiveness, regulatory framework, rule of law, and corruption control).[63] Based on the work of Kaufmann, Kraay, and Zoido-Lobaton, this study defines governance as the traditions and institutions that determine how authority is exercised in a particular country. These include (1) the process by which governments are selected, held accountable, monitored, and replaced; (2) the capacity of governments to manage resources efficiently and formulate, implement, and enforce sound policies and regulations; and (3) the respect of citizens and the state for the institutions that govern economic and social interactions among them. The logical connectedness between the conceptual definition and quantifiable indicators of governance asserts the following: 1) within each of the six Kaufmann, Kraay, and Zoido-Lobaton's indicators, the data are coherent in the sense that each individual indicator provides some useful information about the broader concept of governance to which it is assigned; and 2) although different sources measure governance in very different units, statistical techniques are available that allow us to anchor each source in a common set of units, making them comparable (Kaufmann, Kraay and Zoido-Lobaton 2000, 126-8).[64] Kaufmann, Kraay and Zoido-Lobaton use an "unobserved components model" to

[63] See table 1.5 in Chapter One.

[64] Kaufmann, Kraay, and Zoido-Lobaton explain how a simple variant of an unobserved components model can be used to combine the information from these different sources into aggregate governance indicators. The main advantage of this method is that it allows us to quantify the precision of the both individual sources of governance data as well as the aggregate governance indicators. Their study illustrates the methodology by constructing aggregate indicators of bureaucratic quality, rule of law, and graft for a large sample of 160 countries. However, as they note, although these aggregate governance indicators are more informative about the level of governance than any individual indicator, the standard errors associated with

extract a statistical consensus from the many available indicators corresponding to each of the six broad governance concepts mentioned previously. Primarily measured in qualitative units identifying several hundreds of governance-related indicators, these six indicators are produced by a range of organizations. They include the perspectives of diverse observers and encompass a wide range of topics (e.g., political stability and the business climate, the efficacy of public service provision, experiences with corruption, and so on).[65]

The resulting aggregate governance indicators efficiently summarize the data available and cover virtually all countries in the world.[66] The six governance indicators are measured in units ranging from about –2.5 to 2.5, with higher values corresponding to better governance outcomes. As seen in Appendix 2 and 3, the indicators reflect the statistical compilation of perceptions of the quality of governance of a large number of survey respondents in MDCs and LDCs, as well as NGOs, multilateral organizations, commercial risk rating agencies, and think-tanks during 1997 and 1998 (Kaufmann, Kraay and Zoido-Lobaton, 1999, 1; 2000). Consequently, the Index of quality of governance applied in this study is created by simple addition of the six indicators (ranged from –2.5 to 2.5) and arrayed between –15, the lowest quality of governance to 15, the highest.

Democracy

During the past several decades, a structural definition of democracy has emphasized the arrangement of election procedures and political institutions that place policy-makers under popular control. For example, Schumpeter writes: "the democratic method is that institutional arrangement for arriving at political decisions in which individuals acquire the power to decide by means of a competitive struggle for the people's vote" (Schumpeter 1975, 269). Lipset defines democracy as "a political system which supplies regular constitutional opportunities for changing the governing officials" (Lipset 1959, 71). Olson regards political democratization as "the institutionalization of political organizations and procedures" (Olson 1968, 699). Huntington states: "A political system is defined as democratic to the extent that its most powerful collective decision-makers are selected through periodic elections in which candidates freely compete for votes and in which virtually all the adult population is eligible to vote" (Huntington 1984, 195). Recent studies on democracy and democratization, however, show a considerable degree of consensus on what constitutes the "procedural minimum" of democracy (O'Donnell and Schmitter 1986, 7). The studies show that the procedural minimum of democracy encompasses, among other things, "secret balloting, universal adult suffrage, regular elections, partisan competition,

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estimates of governance are still large relative to the units in which governance is measured (Kaufmann, Kraay and Zoido-Lobaton 1999).

[65] For the details, see Appendix 2, Aggregate Governance Indicators Dataset Sources.

[66] Because they draw on information from many different sources, the aggregate governance indicators are more precise than any individual indicator of governance. For the details, see Appendix 3, Illustrative Governance: Six Operational Indicators of Good Governance.

associational recognition and access, and executive accountability" (O'Donnell and Schmitter 1986, 7-8). This procedural minimum is equivalent to Dahl's eight "institutional requirements" (Dahl 1971).[67] Such definitions of democracy based on the procedural minimum are broader than earlier definitions and therefore avoid what Schmitter and Karl call the "fallacy of electoralism" (Schmitter and Karl 1993, 42)

Adopting a definition of democracy focused on the procedural minimum or the institutional requirements, this study defines democracy as "a (socio-)political system in which, first, decision-makers are chosen through relatively free, fair, and regular elections in which virtually all the adult population is eligible to vote, and second, there exists a considerable level of civil and political liberties - for example, freedom of thought and expression, freedom of the press, freedom of assembly, and demonstration, freedom to form and join organizations, and freedom from terror and unjustified imprisonment" (Huntington 1991, 7; Diamond, Linz and Lipset 1995, 6-7).

In terms of measurement, the procedural minimum definition of democracy consists of three attributes: participation, competition, and civil liberties.[68] This allows researchers to formulate operational measures of democracy in comparative studies. However, due to the shortage of accessible political data and the lack of agreement about the three attributes and their components, the measurement varies considerably on the assessment of democracy. It is said that there are four limitations for measurement of democracy. First, most of the studies rely on data compiled before the eighties and a few were collected after the end of the Cold War. These data exclude many countries, which became independent in the late eighties and nineties, leaving biased samples. Second, they are cumulative in nature: that is, they mostly measure the democratic performance of political development over a time period, one or more decades, or around one time point (e.g. circa 1980, circa 1990). This reduces disparities within time periods and prevents any meaningful analysis of change. Third, most of the previous studies on quantifying democracy limit themselves to specific regions or to certain development levels and economic systems, hence excluding a considerable number of countries. Last, in an effort to maximize the number of cases in the samples, data for missing value for some countries, typically less developed or those with centrally planned economies, are generated through the employment of strategies that rely heavily on presumed high correlation among components. Evidence shows that although they are highly correlated, the scores for all components do not go hand in hand for all cases. In fact, this is the reason for including several attributes and components in such measures (Arat 1991, 22-23; Gastil 1991; Freedom House 2000).

To prevent the above deficiencies from recurring, this study does not construct another democracy index, but instead, employs the Freedom House democracy index. There are crucial reasons to adopt the

[67] According to Dahl, they include: "(1)freedom to form and join organizations; (2) freedom of expression; (3) right to vote; (4) eligibility for public office; (5) right of political leaders to compete for support and votes; (6) alternative sources of information; (7) free and fair elections; (8) institutions for making government policies depend on votes and other expressions of preference" (Dahl 1971, 3).

[68] There are, however, various quantitative studies of the attributes and components of democracy. For the details, see Appendix 4.

index as following. First, it proposes working and practical definitions of democracy annually and has two primarily quantified attributes (political rights and civil liberties).[69] Second, it recognizes a systematic error in subjective measures of democracy, so that this index is statistically reliable and valid to analyze quantified concepts. Third, it presents overall poli-social characteristics with 22 components rather than strict political attributes. The index provides a candid assessment of how far individual states have come in realizing fundamental human rights and poli-social conditions for their citizens, and how far they must go. Fourth, it replicates the results across every year. And last, it estimates the degree of democracy as socio-political conditions in more than 190 countries, almost all political systems in the world.[70] In the two attributes for measuring democracy used by Freedom House, political rights are assessed, on the one hand, by the right to vote, election meaningfulness, multiple political parties, opposition power, and government independence from foreign or military control. On the other hand, civil liberties are covered with the freedom of speech, assembly, and religion and freedom from terrorism or blatant inequality. The Survey rates political rights and civil liberties separately on a seven-category scale, 1 representing the most free and 7 the least free. A country is assigned to a particular numerical category based on responses to the 22 checklist (or 22 components) and the judgments of the Survey team at Freedom House. Consequently, the Freedom House Index perfectly addresses the procedural minimum definition of democracy used here as the conceptual definition, which encompasses the overall poli-socio concepts (Gastil 1978; Freedom House 2000).

Economic Growth

The economic function of environmentalism is measured as the annual growth rate in a country's GDP per capita by adopting the World Development Report, World Bank (1999). Since the primary measure of environmental sustainability refers to 2000-2001, annual growth rate, like the other explanatory variable is measured by an average rate of economic growth for 1990-1998, which satisfies the four criteria of causality by Hume mentioned before. World Bank-calculated economic growth rates are treated as the most reliable indicator in the area of environmental as well as developmental studies. The series for each country are generated by regression equations, which "take the form of log. $X_t = a + bt + e_t$, where this is equivalent to the logarithmic transformation of the compound growth rate equation: $X_t = X_o (1+r)^t$." In this

[69] There are 9 components of political rights and 13 components of civil rights used by Freedom House. For the details of the components, see Appendix 5.

[70] The Freedom House index can be compared with Bollen's liberal democracy index, which is one of the most popular operational definitions of democracy in sociology and comparative politics literature. The Bollen index also has two attributes: political liberties and democratic rule. Bollen defines liberal democracy as "the extent to which a political system allows political liberties and democratic rule" (Bollen 1980; 1993). Political liberties exist to the extent that the people of a country have the freedom to express a variety of political opinions in any media and the freedom to form or to participate in any political group. Democratic rule (or political rights) exists to the extent that the national government is accountable to the general population, and each individual is entitled to participate in the government directly or through representatives (Bollen 1993, 1208-1209).

equation, "X_t is the variable (t is time), a=log X_o and b=log(1+r) are the parameters to be estimated; and e_t is the error term. If b^* is the least squares estimate of b, then the annual average growth rate, r, is obtained as [antilog (b^*)] - 1" (World Bank 1986, 242; 1999). Jackman states: "An advantage of percentage growth rates calculated in this way is that it minimizes the chances of observing heteroscedastic disturbances" [71] (Jackman 1980, 606).

Global Economic Integration

One obvious phenomenon of globalization is the state of a country's exposure to the international economy. It refers not only to the absolute and relative size of the economic flows in and out of a country, but also to the configuration of their economic environment as well. The discussion of global economic integration has largely treated trade integration and financial integration separately. For example, the May 1997 World Economic Outlook (WEO) addressed trade issues, while the October 2001 WEO focused on international financial integration (IMF 1997, 2001). However, one important and general agreement in the literature is that trade liberalization is a precondition for capital account liberalization and a crucial barometer to indicating global economic configuration (WEO 2002, 108-9). To capture the experience of as many countries over as long a period as possible, this study focuses on quantity-based measures of global economic integration. Although global economic integration is not easy to quantify, reflecting difficulties in measuring the nature, extent, intensity, and effectiveness of barriers to transactions involving goods and assets, global economic integration here is defined as the sum of exports and imports of goods and services divided by GDP and is measured as trade share of GDP in percentage. In other words, this study asserts that the level of trade openness represents the level of global economic integration adopting the World Bank database.

Population Growth

Population is based on the *de facto* definition, which counts all residents, regardless of legal status or citizenship, except for refugees not permanently settled in their country of asylum, who are generally considered part of the population of their country of origin. The indicators shown are midyear estimates. Population estimates are usually based on national censuses. Intercensal estimates are interpolations or extrapolations based on demographic models (World Development Report 2000/2001, 319). Accordingly, average annual population growth rate is the exponential rate of change for the period. The United Nations Population Division and national statistical offices provided the data adopted in this study.

[71] The assumption of homoscedasticity or equal spread (that is, equal variance) is that the variance of each disturbance term u_I, conditional on the chosen value of the explanatory variables, is some constant number equal to σ^2. In contrast, if there is heteroscedasticity, then the conditional variance of Y_i increases as X_i increases, that is, the variances of Y_i are not the same.

6. Estimation Problems and Diagnostic Tests

Empirical results from various cross-national studies have been questioned in terms of their basis on inattention to one or more estimation difficulties (Jackman 1980, Bollen and Jackman 1985, and Dietz *et al* 1987). A number of these problems lead us to pay careful attention to outliers, multicollinearity heteroscedasticity, autocorrelation, and nonnormality. Since Ordinary Least Squares (OLS) estimates are reported in this study, it is necessary to be aware that parameter estimates, their standard errors, and the results of F and *t* statistics may be invalidated by violating the assumptions of the Gauss-Markov Theorem.[72] Hence, before conducting regression models and examining the hypotheses, the results of diagnostic tests should be investigated. The logic behind this is that a statistical analysis is based on the ratio between the magnitude of the parameter estimate and a measure of its variance, the *t*-ratio. If the parameter estimate is, in general, about two times greater than its standard error,[73] the parameter estimate is considered as statistically significant and can be interpreted as supporting theories. As another assurance of the robustness of the OLS results, the standard errors will be reestimated using a bootstrap technique, which generates nonparameteric estimates of the parameter standard errors (Efron 1981). Subsampling techniques like the bootstrap are extremely valuable as a tool for assessing the performance of conventional estimators in cases where adherence to assumptions underlying regression procedures may be suspect. The bootstrap technique can be accomplished by subsampling randomly with replacement numerous times. The mean and standard deviation of the parameter estimates from this repeated subsampling provides a second estimate of the ratio between the parameter estimate and its standard error (Diez *et al*. 1987). This method will be also used to gauge the performance of OLS regression procedures when applied to the cross-national sample and to bolster or reduce confidence in the estimates generated by the regression technique. The intuitive appeal and simple logic of the bootstrap method for estimating the statistical significance of the parameters may well have carry-over effects to models exhibiting signs of heteroscedasticity. In both cases of heteroscedasticity and abnormally distributed residuals, the usual method for determining significance of the parameter estimates is suspect. It can be said that the bootstrap method may offer the researcher a help in judging and interpreting results from model estimations plagued with either or both of these problems.

The technical problems referred to above can dramatically affect not only F and *t* statistics, R^2 and adjust R^2 but also interpretation of the empirical results. However, since there is no single solution to all

[72] In an intuitive approach to the Gauss-Markov Theorem, the OLS estimators are linear unbiased estimators under the assumptions of the classical regression model (CRM). They are as following: 1) there is no exact multicollinearity between independent variables; 2) there is no heteroscedasticity problem; 3) disturbances are normally distributed; and 4) there is no autocorrelation between the disturbance terms. To identify the model that best fits the observed data, we need to conduct assumptions tests in addition to tests of significance and R^2 comparisons.

[73] The exact value of what constitutes a statistically significant *t*-ratio depends on the sample size and on several *a priori* decisions of the researcher including the α level and whether the test is to be one or two-tailed.

those problems, a number of techniques to explore and minimize the impact of the problems are employed in this study. The following section will analyze the adopted data in this study and report the results of five diagnostic tests.

Outlier

On the one hand, an observation that is markedly different from, or atypical of, the rest of the observations of a data set is known as an outlier.[74] On the other hand, an observation that causes the regression estimates to be substantially different from what they would be if the observation were removed from the data set is called an influential observation. Observations that are outliers or have high leverage are not necessarily influential, while influential observations usually are outliers and have high leverage (Freund and Wilson 1998, 126-133).[75]

The standard tool for detecting outliers in the response variable is the residual plot. This is a scatter-plot of the residuals ($y-\mu_{y/x}$) on the vertical axis and the estimated values $\mu_{y/x}$ on the horizontal axis. If all is well, such a plot should reveal a random scattering of points around the zero value on the vertical axis.[76] Among the data analyzed in this study, two outliers are found in the variables of global economic integration and population growth: Singapore in the former and Jordan in the latter. However, those two values do not influence the parameter estimate for the data set. In the observation of Singapore in global economic integration data, Cook's D and Hat Diag H values (normally indicative of leverage) are 0.002 and 0.0139, respectively. That is not statistically significant, and its R student value (normally indicative of outlier) is a relatively low -0.9783. Jordan in population growth data also has relatively low leverage value 0.0302 in Hat Diag H and its R Student value as low as –0.9783 (see Appendix B). Hence, we cannot say

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[74] An observation may be an outlier with respect to the response variable and/or the independent variables. Specifically, an extreme observation in the response variable is called an outlier, while extreme values in the independent variables are said to have high leverage and are often called leverage points.

[75] In terms of leverage, outlier, and influential observation, there are seven basic concepts as follows:
1. *Studentized Residuals* are the actual residuals divided by their standard errors. Values exceeding 2.5 in magnitude may be used to indicate outliers;
2. *Cook's D* is an overall measure of the impact of the i^{th} observation on the set of estimated regression coefficients and normally represents the degree of leverage;
3. *Diagonals of the hat matrix* are measures of leverage in the space of the independent variables. Values exceeding 2(m+1)/n may be used to identify observations with high leverage;
4. *DFFITS* are standardized differences between a predicted value estimated with and without the observation in question. Value exceeding $\pm 2\sqrt{p/n}$ in magnitude may be considered *large*;
5. *DFBETAS* are used to indicate which of the independent variables contribute to large DFFITS. Therefore, these statistics are primarily useful for observations with large DFFITS values, where DFBETAS exceeding $\pm 2/\sqrt{n}$ in magnitude may be considered *large*;
6. *COVRATIO* statistics indicate how leaving out an observation affects the precision of the estimates of the regression coefficients. Values outside the bounds computed as may be considered *large*, with values above the limit indicating less precision when leaving the observation out and vice versa for values less than the lower limit;
7. *hi*, the indicator of leverage, is a measure of how *far* the point is from the center of the data.

[76] For one-variable regressions, it may be more useful to use the x-variable on the horizontal axis.

that those two data are influential observations or that they distort the parameter estimate either for the full model or for the reduced model.

Multicollinearity

The assumption of the multiple regression models is that there is no perfect collinearity between independent variables: perfect collinearity implies an exact linear relationship between two variables. Pindyck and Rubinfeld say that a model exhibiting perfect collinearity cannot be solved mathematically because the system of equations to be solved contains two or more equations which are not perfectly independent anyway (Pindyck and Rubinfeld 1981 and 1991, 217). This *rule of thumb* suggests that if the pair-wise or zero-order correlation coefficient between two regressors is high (that is, in excess of 0.8), then multicollinearity is a serious problem. However, technically, high zero-order correlations are a sufficient but not a necessary condition for the existence of multicollinearity because it can exist even though the zero-order of simple correlations is comparatively low -say, less than 0.5- (Gujarati 1995, 335-346). The obvious solution to this problem is to remove one or more of the collinear regressors from the model. Since these regressors are epoxies of one another (that is, they hold essentially the same information), the removal of one will cause no accompanying loss in explanatory power, R^2 or predictive power.[77]

A more difficult problem confronts a researcher when two or more regressors are highly but not exactly correlated with each other. For this case, the condition of multicollinearity has a mathematical solution so that all variables may remain in the model, but care must be taken in the interpretation of the regression results. Because the regression coefficient (parameter estimate) measures the change in the dependent variable due to a change in the particular regressor in question while simultaneously controlling for or holding constant all other regressors, the distribution of estimated regression parameters is quite sensitive to multicollinearity. This sensitivity shows up in the form of high covariation among parameter estimates for the affected regressors and additionally in large standard errors for these same regressors. However, this set of data has no sign of multicollinearity in terms of VIF values and correlation matrices. It will be more specifically discussed with Tables 5.1 to 5.16 in Chapter Five.

Heteroscedasticity

The assumption of homoscedasticity, or equal spread, is that the variance of each disturbance term u_i conditional on the chosen value of the explanatory variables is some constant number, which is equal to σ^2. In contrast, if there is heteroscedasticity, then the conditional variance of Y_i increases as X_i increases.

[77] Furthermore, there are other signs for existence of multicollinearity in the regressors such as 1) if there are high but few significant *t* ratios, and 2) if the Condition Index (CI) is between 10 and 30, there is moderate to strong multicollinearity and if it exceeds 30, there is a severe problem of multicollinearity. The values of VIF indicate the multicollinearity problem for a particular variable, while CI implies the overall multicollinearity problem. According to the conventional wisdom, if there is no collinearity between regressors, VIF will be 1, moderate collinearity if VIF is between 5-10, and if more than 10, there is a serious collinearity problem.

In other words, the variances of Y_i are not the same. In short, if we persist in using the testing procedures despite heteroscedasticity, whatever conclusions we draw or inferences we make may be very misleading (Gujarati 1995, 366). In order to detect a heteroscedasticity problem, this study conducts Spearman's rank correlation test.[78] The results of the test show there is no serious heteroscedasticy problem among the explanatory variables except one variable, global economic integration, which might have a slight heteroscedasticity problem with r_s value of 0.26366 and *t* value of 2.4. Furthermore, heteroscedasticity can also arise as a result of the presence of outliers. An outlying observation, or outlier, is an observation that is much different in relation to the other observations in the sample in terms of R-student, Cook's D, or Hat Diag D. However, as discussed before, there are no serious outliers in the data. Hence we may say that this set of data does not distort or misinterpret the parameter estimate of the OLS analyses.

Autocorrelation

The term autocorrelation can be defined as correlation between the members of the series of observations ordered in time (as in time series data) or space (as in cross-sectional data).[79] In the regression context, the classical linear regression model assumes that such autocorrelation does not exist in the disturbances u_i: symbolically, E (u_i u_j) = 0, $i \neq j$ (Gujarati 1995, 400-401). A salient feature of most economic time series is inertia or sluggishness. As is well known, time series data (for instance, GNP, employment, inflation, etc.) exhibit economic cycles or time-trend. Starting at the bottom of a recession, when economic recovery starts, most of these series start moving upward. Thus, there is a *momentum* built into them, and it continues until something happens to slow them down. Therefore, in regressions involving time series data, successive observations are likely to be interdependent. There are also other causes of this problem. They can be summarized as the following: specification biases, cobweb phenomena, lags, and manipulation of data.[80] It should be also noted that autocorrelation can be positive as well as negative, although most economic time series generally exhibit positive autocorrelation because most of them either move upward or downward over extended time periods and do not exhibit a constant up-and-down movement.

It is apparent from the equation of $d = 2 (1 - \rho)$. In this formula, if there is no serial correlation ($\rho = 0$), *d* is expected to be about 2. Therefore, as a rule of thumb, if *d* is found to be 2 in an application, one

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[78] For Spearman's rank correlation test, we need $r_s = 1-6[\Sigma d_i^2/n(n^2-1)]$: where di = difference in the ranks assigned to two different characteristic of i th individuals or phenomena and n = number of individuals or phenomena ranked, and *t* value, $t=r_s\sqrt{n-2}/\sqrt{1-r_s^2}$. If the computed *t* value exceeds the critical *t* value, we may accept the hypothesis of heteroscedasticity, otherwise we may reject it.

[79] Some authors call autocorrelation in cross-sectional data as spatial autocorrelation, that is, correlation in space rather than over time (Gujarati 1995).

[80] Each case may be described as *excluded variables case* (some variables that were originally candidates but were not included in the model for a variety of reasons should be included.) and *incorrect functional form*, *Cobweb phenomenon* (with a lag of one time period because some decisions take time to implement and are influenced by the situation prevailing last year), *Lags* (one of the explanatory variables is the lagged value of the dependent variable), and *Manipulation of data* (the raw data are often manipulated).

may assume that there is no first-order autocorrelation, either positive of negative. If $\rho = +1$, indicating perfect positive correlation in the residuals, $d = 0$. Thus, the closer d is to 0, the greater the evidence of positive serial correlation. If $\rho = -1$, implying perfect negative correlation among successive residuals, $d = 4$. Hence, the closer d is to 4, the greater the evidence of negative serial correlation. In the full-data equation with Durbin-Watson *d* value 1.836, we may assume that there is no autocorrelation. $\rho = 1 - (d/2) = 1 - (1.836/2) = 0.082$. The ρ values are also closer to 0, which indicate no autocorrelation. It may be stated as a general principal that whenever we use an estimator in place of the true value, the estimated OLS coefficients have the usual optimum properties only asymptotically, which is in the condition of the large samples. Also, the conventional hypothesis testing procedures are, strictly speaking, valid asymptotically. In small sample (the conventional wisdom says 20), therefore, one has to be careful in interpreting the estimated results. In this study, data of 122-sample size are obviously more than 20. Therefore, the interpretation of no autocorrelation problem is fairly acceptable.

Nonnormality

Dietz et al. caution researchers that OLS may perform poorly when used with cross-national data due to violations of the assumption of normally disturbed residuals in the population from which the sample was drawn (Dietz *et al*.1987). They argue that nonnormality of the residuals may make parameter estimates inefficient, similar to the effects of heteroscedasticity, and may even under some circumstances yield biased estimates. Like the case for heteroscedasticitic disturbances, probabilistic tests for the statistical significance of the parameter estimates may be invalid because estimates of the standard errors for the coefficients may be inaccurate. They continuously claim the lack of normally distributed errors reduces the value of the conventional rule, the *t* ratio greater than 1.5 rule, since the rationale for this rule rests on an assumption of normal errors.

One method for testing normality is the Jarque-Bera (JB) test. The JB test of normality is an asymptotic, or large-sample, test. It is also based on the OLS residuals, which is skewness and kurtosis measures of the OLS residuals.[81] A normal distribution implies that the value of skewness is zero and the value of kurtosis is 3 (it can also be zero). Under the null hypothesis that the residuals are normally distributed, Jarque and Bera show that asymptotically (i.e. in large samples) the JB statistic given in the equation of $JB = n[s^2/ 6 + (k-3)^2 / 24]$ (S: skewness K: kurtosis) follows the chi-square distribution with 2 degree of freedom (Gujarati 1995, 65-68, 143-144). In addition, this study conducts the JB normality test with k instead of k-3, that is, $JB = n[s^2/ 6 + k^2 / 24]$. Accordingly, after conducting the JB test, we have the p values of obtaining such chi-square values for 2 degrees of freedom are less than about 0.005 for the k-3 option and about 0.62 for the k option, with the JB values of 19.94 from the k-3 option and 0.8913 from the k option. Thus, in the k-3 option, the p value of the computed chi-square is sufficiently low, so we can

[81] Skewness is a measure of the asymmetry of the distribution shape, and Kurtosis is a measure of the relative shape of the middle and tails, in other words, a measure of the peakedness of the distribution.

reject the hypothesis that the residuals are normally distributed. However, if we take the k option, the p value, about 0.62 of the chi-square, is reasonably high enough not to reject the normality assumption. Thus, if we take the k option, we may say that the residuals are normally distributed.

7. Summary

This chapter discussed the utility of cross-national analysis in the comparative research and identified independent and dependent variables. Especially, the various operational definitions in the logic of world environmentalism, governance, and domestic / international economic conditions are deeply associated with the trials of reconceptualization of those issues in Chapter One. Even though some indicators proposed here do not perfectly match the desired measurement, which I willingly admit, these trials are worth enough to encourage the further empirical studies, and more importantly, these measures have better explanatory power on the dynamic interactions of environmental politics on both national and international levels. Moreover, the several problems of quantitative research are discussed and the set of data is analyzed with proper statistical techniques for diagnostic tests. In the next chapter, accordingly, with the refined data, the investigation of the relationship between the multifaceted conditions of international and domestic factors and the level of environmental sustainability in national level analyses and critical tests of the major hypotheses in the competing theories of environmentalism will be pursued.

Chapter Five. Environmental Sustainability Models and Empirical Results

1 Introduction

The impact of multifaceted characteristics of political, economic and international influences on environmental sustainability in national-level analyses is evaluated by using bivariate descriptive statistics (correlation matrix) and multivariate analyses (OLS regression) in this chapter. Bivariate descriptive statistics addresses the zero-order correlations among all variables, which consist of one for all 122-sample country and six regional-economic groups, i.e. Asia, Latin America and the Caribbean, The Middle East and North Africa, Sub-Saharan Africa, East and Central Europe and the OECD member states. And then, multivariate analyses with five independent variables are presented.

The estimation framework in this study is formulated such that the key issues relating to environmental sustainability are unfolded. These issues include: (1) the factors that have contributed to the expansion and achievement of a national-level sustainability; (2) the effect of improvement in social and political conditions on environmental policies and standards; and (3) the spillover effects of economic growth and global economic integration on the environment. In other words, the estimation framework encompasses competing theories and arguments such as political elasticity theory, pro-democracy environmentalism, the anti-democracy environmental movement, the LG (Limit-to-Growth) hypothesis, the IUC (Inverted U-Curve) hypothesis, neoclassical economic argument of the World Bank and the argument of anti-globalist movement. The discussion of the estimation framework highlighting each of the key issues and the structural equations to be tested are discussed as follows. The level of environmental sustainability (ES) is hypothesized to be influenced by quality of governance (QG), the level of democracy (DEM), economic growth (EG), the level of global economic integration (GEI) and population growth (PG). Hence the equation is summarized as $ES = \beta_0 + QG\beta_1 + DEM\beta_2 + EG\beta_3 + GEI\beta_4 + PG\beta_5 + \varepsilon$. This chapter, accordingly, portrays a total of fifty six environmental sustainability models, along with seven correlation matrixes, and analyzes multidimensional dynamics of environmental politics based on the literature.

2 Bivariate Analyses

Pearson correlation, mean, standard deviation and coefficient of the variation for all variables included in 122-sample country and six regional analyses are presented in Table 5.1 to 5.7. Each is discussed in turn.

Correlation Matrix for All Sample Countries

Examination of Table 5.1 reveals that correlations between predictor variables range from a low of .008 to .776 for all sample countries. Multicollinearity does not appear because no correlation coefficient is

Table 5.1. Descriptive Statistics and Bivariate Analysis for 122 Sample Countries

	Mean	Std. Deviation	N
ES	49.4148	11.48337	122
QG	2.5851	.77747	122
DEM	9.3443	3.63584	122
EG	2.2974	3.95249	116
GEI	32.7726	33.55113	113
PG	1.6693	1.34481	114

		ES	QG	DEM	EG	GEI	PG
ES	Pearson Correlation	1					
	Sig. (2-tailed)	.					
	N	122					
QG	Pearson Correlation	.776**	1				
	Sig. (2-tailed)	.000	.				
	N	122	122				
DEM	Pearson Correlation	.691**	.769**	1			
	Sig. (2-tailed)	.000	.000	.			
	N	122	122	122			
EG	Pearson Correlation	.008	.162	-.037	1		
	Sig. (2-tailed)	.932	.082	.693	.		
	N	116	116	116	116		
GEI	Pearson Correlation	.410**	.618**	.355**	.121	1	
	Sig. (2-tailed)	.000	.000	.000	.200	.	
	N	113	113	113	113	113	
PG	Pearson Correlation	-.428**	-.421**	-.409**	.454**	-.239*	1
	Sig. (2-tailed)	.000	.000	.000	.000	.012	.
	N	114	114	114	113	110	114

** = < 0.01 (2-tailed).
* = < 0.05 (2-tailed).

greater than .8 between two predictor variables, although the absence of a high correlation does not absolutely rule out the existence of collinearity.[82]

The highest correlation (r=.77) is the relationship between quality of governance and environmental sustainability, which is consistent to the theoretical expectation of political elasticity theory with statistical significance. This result implies that the more government or those in authority can integrate and alternate soft forms of political power, linking incentives to persuasion, with hard forms of power, including disincentives and coercion, the more effective they will be and the more achieved environmental sustainability will be. The democracy variable also has a strong, positive relationship with environmental sustainability (r=.69). This result is consistent to the argument of pro-democracy environmentalism, which contends that environmental policy outputs and sustainability should significantly improve in a democratic society or after a democratic transition. Contrary to the *a priori* expectations, the variables of economic growth and global economic integration are positively related to environmental sustainability although only global economic integration variable is statistically significant (r=-.00; r=-.41, respectively). These results can support the argument of IUC hypothesis, suggesting that although environmental quality may worsen with economic growth and/or expansion, it eventually improves with accumulated technology, information, capital and interdependence with other countries. Finally the variable of population growth is negatively associated with environmental sustainability in the expected direction with statistical significance (r=-.42). In an overall view, these results imply that social and political conditions have more explanatory power for environmental sustainability than economic conditions have.

Correlation Matrix for Asia

Findings in Table 5.2 show that correlations between predictor variables range from a low of .032 to a high of .722 for sample Asian countries. Although no one guarantees the non-existence of multicollinearity in the data, the rules of thumb say that there is no serious problem here.

The highest correlation is found in the relationship between the variables of quality of governance and global economic integration with statistical significance (r=.72). This result can support the argument of World Bank's neoclassical economics that the consequences of trade liberalization and expansion change state capability in promoting efficiency and effectiveness of governmental functions, subjecting state institutions to greater competition, making the state more responsive to people's needs and bringing government closer to the people through broader participation and decentralization of government activities.[83] This result also supports the Bank's programs of economic structural reforms after the 1997 financial crisis in East and Southeast Asia. The variables of economic and population growth are negatively related to environmental sustainability (r = -.51; r = -29 respectively), while quality of governance,

[82] A correlation coefficient less than .8 is acceptable level by "rules of thumb" of statistical analyses (Gujarati 1995, 4; Pindyck and Rubinfeld 1991, 217).
[83] Tussie (1995) and Tussie and Fernanda (1997) well summarize the arguments of the MDBs' neoclassical economic view on global economic integration and improvement of state capability.

Table 5.2. Descriptive Statistics and Bivariate Analysis for Asia

	Mean	Std. Deviation	N
ES	44.4647	6.41258	17
QG	2.4609	.65052	17
DEM	8.1765	3.52199	17
EG	5.4875	2.69614	16
GEI	36.0063	64.17702	16
PG	1.9688	.72454	16

		ES	QG	DEM	EG	GEI	PG
ES	Pearson Correlation	1					
	Sig. (2-tailed)	.					
	N	17					
QG	Pearson Correlation	.352	1				
	Sig. (2-tailed)	.166	.				
	N	17	17				
DEM	Pearson Correlation	.384	.392	1			
	Sig. (2-tailed)	.128	.119	.			
	N	17	17	17			
EG	Pearson Correlation	-.513*	-.039	-.687**	1		
	Sig. (2-tailed)	.042	.885	.003	.		
	N	16	16	16	16		
GEI	Pearson Correlation	.172	.722**	-.163	.289	1	
	Sig. (2-tailed)	.525	.002	.547	.277	.	
	N	16	16	16	16	16	
PG	Pearson Correlation	-.290	-.281	-.338	.032	.106	1
	Sig. (2-tailed)	.275	.292	.201	.906	.697	.
	N	16	16	16	16	16	16

** = < 0.01 (2-tailed).
* = < 0.05 (2-tailed).

democracy and global economic integration variables are positively associated with the dependent variable (r=.35; r=.38; r=.17 respectively), although only economic growth variable has statistical significance. These results are consistent with the theoretical expectation of the LG hypothesis, which contends that expanding human economy should be associated with an increase in environmental degradation. In an overall view of the Asian case, economic conditions have more explanatory power for environmental sustainability than social and political conditions. Although these results support the arguments of political elasticity theory, pro-democracy environmentalism and IUC hypothesis, the relationships are not statistically significant.

Correlation Matrix for Latin America and the Caribbean

The examinations in Table 5.3 show that correlations between predictor variables range from a low of .039 to a high of .678 for the case of Latin America and the Caribbean. Multicollinearity does not appear in this region.

The highest correlation (r=.67) is the relationship between quality of governance and democracy, while the association between democracy and environmental sustainability is positive (r=.27) but weak relationship without statistic significance. The second highest correlation (r=.65) is found in the relationship between economic growth and the dependent variable with statistical significance. The relationship (r=.61) between quality of governance and environmental sustainability is also highly associated, which is consistent with the theoretical expectation of political elasticity theory with statistical significance. These results imply that the arguments of IUC hypothesis and political elasticity theory are statistically confirmed in this region. Contrary to the *a priori* expectations, the variable of global economic integration is positively related to environmental sustainability without statistical significance (r=.03). As expected, the variable of population growth is negatively associated to the dependent variable without statistical significance (r=-31). In an overall view, one interesting thing in this region is there are positive and strong relationships between socio-political and economic conditions and environmental sustainability. Unlike the Asian case, these results imply that quality of governance and economic growth should be given attention to explain the degree of environmental sustainability.

Correlation Matrix for the Middle East and North Africa

Findings in Table 5.4 show that correlations between predictor variables range from a low of .023 to a high of .645 for the case of the Middle East and North Africa. Although no one guarantees the non-existence of multicollinearity in the data, the rules of thumb say that there is no serious problem here.

The highest correlation is found in the relationship between the variables of quality of governance and global economic integration with statistical significance (r=.64). This result is consistent to the argument of World Bank's neoclassical economics, which has a pattern similar to the Asian case, as we have seen. The relationship (r=.31) between quality of governance and environmental sustainability is

Table 5.3. Descriptive Statistics and Bivariate Analysis for Latin America and the Caribbean

	Mean	Std. Deviation	N
ES	51.0045	8.42844	22
QG	2.4259	.48263	22
DEM	9.9545	2.69881	22
EG	3.5524	2.04294	21
GEI	29.3143	20.53291	21
PG	2.2000	.66886	20

		ES	QG	DEM	EG	GEI	PG
ES	Pearson Correlation	1					
	Sig. (2-tailed)	.					
	N	22					
QG	Pearson Correlation	.615**	1				
	Sig. (2-tailed)	.002	.				
	N	22	22				
DEM	Pearson Correlation	.277	.678**	1			
	Sig. (2-tailed)	.213	.001	.			
	N	22	22	22			
EG	Pearson Correlation	.650**	.520*	.299	1		
	Sig. (2-tailed)	.001	.016	.188	.		
	N	21	21	21	21		
GEI	Pearson Correlation	.039	.356	.602**	-.049	1	
	Sig. (2-tailed)	.867	.113	.004	.833	.	
	N	21	21	21	21	21	
PG	Pearson Correlation	-.318	-.576**	-.358	-.073	-.125	1
	Sig. (2-tailed)	.172	.008	.121	.759	.598	.
	N	20	20	20	20	20	20

** = < 0.01 (2-tailed).
* = < 0.05 (2-tailed).

Table 5.4. Descriptive Statistics and Bivariate Analysis for the Middle East and North Africa

	Mean	Std. Deviation	N
ES	38.4500	5.12666	14
QG	2.0886	.64644	14
DEM	5.0000	2.48069	14
EG	4.1667	2.25281	12
GEI	17.2909	9.69582	11
PG	2.5583	1.69944	12

		ES	QG	DEM	EG	GEI	PG
ES	Pearson Correlation	1					
	Sig. (2-tailed)	.					
	N	14					
QG	Pearson Correlation	.310	1				
	Sig. (2-tailed)	.280	.				
	N	14	14				
DEM	Pearson Correlation	.526	.586*	1			
	Sig. (2-tailed)	.054	.028	.			
	N	14	14	14			
EG	Pearson Correlation	.095	.023	-.214	1		
	Sig. (2-tailed)	.768	.943	.505	.		
	N	12	12	12	12		
GEI	Pearson Correlation	-.198	.645*	.158	-.190	1	
	Sig. (2-tailed)	.559	.032	.643	.576	.	
	N	11	11	11	11	11	
PG	Pearson Correlation	.180	-.272	-.064	-.051	.500	1
	Sig. (2-tailed)	.575	.392	.845	.883	.141	.
	N	12	12	12	11	10	12

** = < 0.01 (2-tailed).
* = < 0.05 (2-tailed).

positive but without statistical significance. It implies that although political elasticity theory can explain the degree of environmental sustainability in the region of the Middle East and North Africa, it fails confirmation statistically. The variables of democracy and economic growth are also positively related to the dependent variable, but they do not have statistical significance (r=.52; r=.09 respectively). As expected, global economic integration variable is negatively associated, while population growth variable is positively related to the dependent variable (r=-.19; r=.18 respectively). In an overall view of this region, theses results imply that social and political conditions have more explanatory power for environmental sustainability than economic conditions have.

Correlation Matrix for Sub-Saharan Africa

Examination of Table 5.5 reveals that correlations between predictor variables range from a low of .051 to .655 for the case of Sub-Saharan Africa. Multicollinearity does not appear because no correlation coefficient is greater than .8 between two predictor variables.

The highest correlation (r=.65) is the relationship between quality of governance and democracy, which is consistent to the theoretical expectation of political elasticity theory with statistical significance. This result implies that good governance includes much broader public policy considerations than assessment of government structure or location of public service production or provision. And also it integrates institutional incentives, interests and information with citizens' involvement in political processes. The relationship (r=.54) between quality of governance and environmental sustainability is positive and statistically significant. This result also statistically confirms that political elasticity theory has strong explanatory power for the dependent variable in this region. Contrary to the *a priori* expectations, the variable of global economic integration is positive and statistically significant. This result supports the argument of World Bank's neoclassical economic theory. The variable of democracy and economic growth are also positively related to environmental sustainability, but they do not have statistical confirmation. As expected, population growth is negatively associated with the dependent variable. In an overall view of this region, there are positive and strong relationships between socio-political and economic conditions and environmental sustainability. This pattern has been seen in the case of Latin America and the Caribbean. These results imply that political elasticity theory and World Bank's neoclassical economic arguments have strong explanatory power for environmental sustainability in this region.

Correlation Matrix for East and Central Europe

Findings in Table 5.6 show that correlations between predictor variables range from a low of .015 to a high of .849 for the case of East and Central Europe. Multicollinearity problems are found in the two relationships between quality of governance and democracy, and between quality of governance and global economic integration (r=.84; r=.81 respectively). Since all the problematic variables are independent ones,

Table 5.5. Descriptive Statistics and Bivariate Analysis for Sub-Saharan Africa

	Mean	Std. Deviation	N
ES	42.3542	6.84544	24
QG	2.1676	.45868	24
DEM	7.7917	2.91889	24
EG	2.7583	2.44165	24
GEI	18.7870	12.61036	23
PG	2.9043	.41503	23

		ES	QG	DEM	EG	GEI	PG
ES	Pearson Correlation	1					
	Sig. (2-tailed)	.					
	N	24					
QG	Pearson Correlation	.547**	1				
	Sig. (2-tailed)	.006	.				
	N	24	24				
DEM	Pearson Correlation	.382	.655**	1			
	Sig. (2-tailed)	.065	.001	.			
	N	24	24	24			
EG	Pearson Correlation	.391	.606**	.458**	1		
	Sig. (2-tailed)	.059	.002	.024	.		
	N	24	24	24	24		
GEI	Pearson Correlation	.496*	.439*	.283	.135	1	
	Sig. (2-tailed)	.016	.036	.191	.541	.	
	N	23	23	23	23	23	
PG	Pearson Correlation	-.087	-.051	.173	.286	.090	1
	Sig. (2-tailed)	.692	.816	.429	.186	.691	.
	N	23	23	23	23	22	23

** = < 0.01 (2-tailed).
* = < 0.05 (2-tailed).

Table 5.6. Descriptive Statistics and Bivariate Analysis for East and Central Europe

	Mean	Std. Deviation	N
ES	49.4952	7.82390	21
QG	2.3707	.55192	21
DEM	9.5238	3.24991	21
EG	-3.1714	4.91713	21
GEI	27.9750	16.58036	20
PG	.0571	.86924	21

		ES	QG	DEM	EG	GEI	PG
ES	Pearson Correlation	1					
	Sig. (2-tailed)	.					
	N	21					
QG	Pearson Correlation	.667**	1				
	Sig. (2-tailed)	.001	.				
	N	21	21				
DEM	Pearson Correlation	.552**	.849**	1			
	Sig. (2-tailed)	.009	.000	.			
	N	21	21	21			
EG	Pearson Correlation	.332	.436*	.218	1		
	Sig. (2-tailed)	.141	.048	.343	.		
	N	21	21	21	21		
GEI	Pearson Correlation	.769**	.813**	.609**	.378	1	
	Sig. (2-tailed)	.000	.000	.004	.100	.	
	N	20	20	20	20	20	
PG	Pearson Correlation	-.342	-.516*	-.468*	.015	-.434	1
	Sig. (2-tailed)	.129	.017	.032	.947	.056	.
	N	21	21	21	21	20	21

** = < 0.01 (2-tailed).
* = < 0.05 (2-tailed).

we should carefully interpret the empirical results and should not apply the pairs of variables, which contain the problem, to multivariate analyses in next section.

The relationship (r=.66) between quality of governance and environmental sustainability is positive and statistically significant. This result is consistent with the theoretical expectation of political elasticity theory. The variable of democracy also positively related to the dependent variable and has statistical confirmation (r=.55). This result supports the argument of pro-democracy environmentalism. Contrary to the *a priori* expectations, the economic conditions such as economic growth and global economic integration variables (r=.33; r=.76 respectively) are positively associated with environmental sustainability although only the latter variable has statistical significance. These results confirm that the arguments of IUC hypothesis and neoclassical economics have strong explanatory power for environmental sustainability in this region. Population growth variable (r=-.34) is negatively related to the dependent variable in the expected direction without statistical confirmation. In an overall view, these results show that socio-political and economic conditions are equally important to explain the dependent variable. Unlike the cases of other regions, these results imply that quality of governance, democracy and global economic integration should be given attention to explain the degree of environmental sustainability in this regional analysis.

Correlation Matrix for the OECD

Examination of Table 5.7 reveals that correlations between predictor variables range from a low of .021 to .861 for the OECD member states. Multicollinearity problems are found in the two relationships between quality of governance and democracy, and between quality of governance and environmental sustainability (r=.86; r=.81 respectively). Since the problematic pair of independent variables is in the relationship between quality of governance and democracy, we should not apply this pair of variables to multivariate analyses in next section. In the member states of the OECD, the variable of quality of governance is the most important variable to explain the dependent variable with statistical significance. This result is consistent with the theoretical expectation of political elasticity theory. As expected, the variable of democracy (r=.66) is also positive and statistically significant for the relationship with environmental sustainability. This result supports the argument of pro-democracy environmentalism. Contrary to the *a priori* expectations, global economic integration variable (r=.33) is positively related to the dependent variable, while economic growth variable (r=-.08) has negative impact on environmental sustainability. However, both variables fail to confirm the arguments of World Bank's neoclassical economics and LG hypothesis statistically in this category. Contrary to the *a priori* expectation, population growth variable (r=.09) is positively associated with the dependent variable without statistical significance. In an overall view, these results imply that social and political conditions have more explanatory power for the degree of environmental sustainability than economic conditions in the member states of the OECD.

Table 5.7. Descriptive Statistics and Bivariate Analysis for the OECD

	Mean	Std. Deviation	N
ES	62.0267	11.10616	30
QG	3.5529	.55748	30
DEM	13.0000	1.55364	30
EG	2.4000	1.72792	29
GEI	52.7379	31.17234	29
PG	.6172	.59586	29

		ES	QG	DEM	EG	GEI	PG
ES	Pearson Correlation	1					
	Sig. (2-tailed)	.					
	N	30					
QG	Pearson Correlation	.816**	1				
	Sig. (2-tailed)	.000	.				
	N	30	30				
DEM	Pearson Correlation	.660**	.861**	1			
	Sig. (2-tailed)	.000	.000	.			
	N	30	30	30			
EG	Pearson Correlation	-.088	.058	-.055	1		
	Sig. (2-tailed)	.649	.765	.776	.		
	N	29	29	29	29		
GEI	Pearson Correlation	.331	.520**	.417*	.167	1	
	Sig. (2-tailed)	.079	.004	.024	.388	.	
	N	29	29	29	29	29	
PG	Pearson Correlation	.090	-.021	-.347	.468*	-.059	1
	Sig. (2-tailed)	.641	.915	.065	.011	.760	.
	N	29	29	29	29	29	29

** = < 0.01 (2-tailed).
* = < 0.05 (2-tailed).

Bivariate Comparisons of Regional Analyses

Table 5.8 summarizes the bivariate statistics of Table 5.1 through 5.7 and shows three the highest correlated pairs of relationships in seven categories. For the case of all sample countries, the environmental sustainability variable is positively related to the variables of quality of governance and democracy with statistical significance. Quality of governance is also positively associated with democracy. The Asian case reveals that quality of governance is positively related to the variable of global economic integration, while economic growth is negatively associated with both variables of environmental sustainability and democracy. The case of Latin America and the Caribbean shows that environmental sustainability is positively related to quality of governance and economic growth, and democracy also positively relates to quality of governance. All three relationships are statically confirmed. The Middle East and North African case shows that quality of governance is positively related to democracy and global economic integration with statistical significance, and environmental sustainability is also positively associated with democracy without statistical confirmation. The case of Sub-Saharan Africa shows that quality of governance positively relates to environmental sustainability, democracy and economic growth. All relationships are statically confirmed. East and Central European case shows that quality of governance is positively related to democracy and economic growth with statistical significance, and environmental sustainability is also positively associated with the global economic integration variable with statistical confirmation. Finally, the case of the OECD countries shows that quality of governance is positively related to environmental sustainability and democracy, and environmental sustainability also positively relates to democracy. All three highest correlated pairs are statistically confirmed.

3 Multivariate Analyses

In this section, I test and analyze a total of fifty-six environmental sustainability models based on the competing theoretical assumptions and computerized-selections of statistics.[84] Parameter estimates, standard errors, beta coefficients, and VIFs for all models included in the 122-sample country and six regional analyses are presented in Tables 5.9 to 5.15.

Multivariate Analysis for All Sample Countries

Table 5.9 contains the eight best environmental sustainability models of all the 122-sample country with full data and shows various combinations of the dependent and independent variables. The diagnostic testing performed on the equations reveals no serious problem. In regard to the variance of the disturbance terms, overall, the results show no strong evidence of heteroscedasticity. Also, there is little

[84] Technically, a computer-software program (SASv8) can compose a total of 217 different models with five independent variables and seven categories: the equation can be described as 2^k-1, where k stands for the number of independent variables. For more details, see Appendix 8.

Table 5.8. Bivariate Comparisons of Regional Analyses

All Sample	Asia	LAC	MENA	SSA	ECE	The OECD
+**	+**	+**	+*	+**	+**	+**
ES-QG	QG-GEI	QG-DEM	QG-GEI	QG-DEM	QG-DEM	QG-DEM
+**	-**	+**	+*	+**	+**	+**
DEM-QG	DEM-EG	ES-EG	QG-DEM	QG-EG	QG-GEI	ES-QG
+**	-**	+**	+	+**	+**	+**
ES-DEM	ES-EG	ES-QG	ES-DEM	ES-QG	ES-GEI	ES-DEM

** = < 0.01 (2-tailed); * = < 0.05 (2-tailed).

ES (Environmental Sustainability)
QG (Quality of Governance)
DEM (Democracy)
EG (Economic Growth)
GEI (Global Economic Integration)
PG (Population Growth)
LAC (Latin America and the Caribbean)
MENA (the Middle East and North Africa)
SSA (Sub-Saharan Africa)
ECE (East and Central Europe)
OECD (Organization for Economic Cooperation and Development)

Table 5.9. Results of Parameter Estimates of the OLS Regression for 122 Sample Countries

		1-1	1-2	1-3	1-4	1-5	1-6	1-7	1-8
QG	b	9.79***	10.43***	8.85***	9.56***	12.25***	12.94***	9.87***	9.48***
	s.e.	1.70	1.62	1.42	1.56	1.28	1.09	1.58	1.33
	β	0.64	0.70	0.58	0.63	0.81	0.87	0.66	0.63
	vif	4.10	3.72	2.94	3.47	2.26	1.63	3.50	2.59
DEM	b	0.63**	0.62**	0.72**	0.65**			0.72**	0.70**
	s.e.	0.29	0.30	0.28	0.29			0.29	0.28
	β	0.19	0.19	0.22	0.19			0.22	0.21
	vif	2.52	2.63	2.42	2.47			2.47	2.52
EG	b	-0.07	-0.24	-0.11		-0.13	-0.32*		-0.25
	s.e.	0.21	0.17	0.20		0.21	0.16		0.16
	β	-0.02	-0.08	-0.03		-0.04	-0.11		-0.08
	vif	1.68	1.08	1.67		1.65	1.02		1.09
GEI	b	-0.03	-0.02		-0.03	-0.04*	-0.03	-0.02	
	s.e.	0.02	0.02		0.02	0.02	0.02	0.02	
	β	-0.09	-0.08		-0.09	-0.12	-0.11	-0.07	
	vif	1.71	1.70		1.71	1.63	1.62	1.70	
PG	b	-1.17*		-1.03	-1.31**	-1.27*			
	s.e.	0.67		0.67	0.54	0.68			
	β	-0.13		-0.11	-0.15	-0.14			
	vif	1.97		1.94	1.28	1.96			
Constant		21.28***	18.11***	21.59***	21.80***	21.64***	18.05***	18.01***	18.79***
R^2		.67	.65	.67	.67	.66	.63	.64	.65
adj. R^2		.66	.63	.66	.66	.64	.62	.63	.64
RMSE		6.66	6.83	6.66	6.63	6.78	6.93	6.86	6.80

* = $p < 0.10$; ** = $p < 0.05$; *** = $p < 0.01$

evidence of autocorrelation in the residuals, which is, indeed, a very common problem in timeseries regressions. The test for normality reveals little evidence to suggest rejecting the null hypothesis.

Parameter estimates of equations 1 to 8 indicate that the variables of quality of governance and democracy have a strong effect on the dependent variable, environmental sustainability. In particular, the quality of governance variable, as the most important determinant in the models, is consistently positive and statistically significant through all equations (p=0.01) and has an acceptable highest VIF score (4.10). This result confirms the proposed hypothesis in this study, which notes the quality of national governance is intrinsically related to, and even generates pressure for, environmental sustainability. This implies that improvement of national governance quality leads to changes in exercising power patterns that positively impact the efficiency and effectiveness of environmental policies as well as governmental process, capacity and interactions with the public. This is consistent to the theoretical expectation of political elasticity theory as we have seen in chapter two.

Among other independent variables chosen, the democracy variable is also statistically significant (p=0.05), whose effect is stable and consistent across six equations. The highest VIF (2.63) is not problematic. This result suggests strong support for the proponents of pro-democracy environmentalism. However, economic growth, global economic integration and population growth have little influence on the dependent variable, although they are in the expected directions. The highest VIF of all three variables are below conventional levels. These results reveal some support for the arguments of LG hypothesis and anti-globalist movement over the proponents of IUC hypothesis and neoclassical economic frames on the debates of environmental sustainability.

The overall results suggest that social and political conditions are more likely to explain the degree of environmental sustainability than economic conditions. This result is also consistent with the results of previous bivariate analyses. Consequently, equation 1-4 can be chosen the best model for delineating environmental sustainability analysis for all 122-sample country. The justification includes statistical significance for three parameter estimates of national governance quality, democracy and population growth rate; the highest adjusted R^2 of .66; and the lowest RMSE of 6.63. It explains 66 percent of the variation of the different degree of environmental sustainability achievement.

Multivariate Analysis for Asia

Table 5.10 contains the eight best environmental sustainability models for sample Asian countries and shows various compositions of the dependent and independent variables. The diagnostic testing performed on the equations reveals no serious problem. The test of variance of the disturbance terms indicates little evidence of heteroscedasticity. And also, the tests of autocorrelation and normality in the residuals reveal little evidence to suggest rejecting the null hypotheses.

Parameter estimates of equations 1 to 8 indicate that the variable of economic growth is the greatest determinant for explaining the variations of environmental sustainability in the case of Asia. This

Table 5.10. Results of Parameter Estimates of the OLS Regression for Asia

		2-1	2-2	2-3	2-4	2-5	2-6	2-7	2-8
QG	b	1.53	1.12		4.16	4.55	3.80	3.89	
	s.e.	4.98	4.62		2.67	2.60	3.84	2.51	
	β	0.13	0.10		0.37	0.40	0.33	0.34	
	vif	3.77	3.53		1.14	1.11	2.42	1.08	
DEM	b	-0.23		-0.17	-0.30	-0.07			
	s.e.	0.71		0.66	0.68	0.62			
	β	-0.11		-0.09	-0.15	-0.03			
	vif	2.52		2.35	2.46	2.10			
EG	b	-1.61*	-1.44**	-1.66*	-1.46*	-1.28	-1.28*	-1.21**	-1.50**
	s.e.	0.85	0.62	0.80	0.79	0.75	0.60	0.52	0.53
	β	-0.65	-0.58	-0.67	-0.59	-0.52	-0.52	-0.49	-0.61
	vif	2.29	1.34	2.23	2.11	1.96	1.26	1.00	1.09
GEI	b	0.02	0.03	0.04			0.00		0.03
	s.e.	0.04	0.04	0.02			0.03		0.02
	β	0.27	0.29	0.38			0.07		0.38
	vif	3.66	3.58	1.11					1.10
PG	b	-2.73	-2.51	-3.10	-2.00			-1.61	-2.84
	s.e.	2.62	2.42	2.24	2.28			2.04	1.93
	β	-0.30	-0.27	-0.34	-0.21			-0.17	-0.31
	vif	1.58	1.47	1.25	1.26			1.08	1.01
Constant		55.75**	53.31***	59.71***	48.42***	40.57***	41.53***	44.39***	56.86***
R^2		.47	.47	.47	.45	.42	.42	.44	.47
adj. R^2		.21	.28	.28	.26	.27	.27	.31	.33
RMSE		5.85	5.61	5.60	5.69	5.63	5.62	5.49	5.38

* = $p < 0.10$; ** = $p < 0.05$; *** = $p < 0.01$

variable is consistently negative and statistically significant across all equations except the model 2-5 and has an acceptable highest VIF score (2.29). This result confirms the proponents of LG hypothesis frame, which argues that economic growth requires exploitation of natural resources for expanding production of material goods and dumping of the waste products of this production into the environment. The modern "treadmill of production" inexorably degrades the environment (Schnaiberg and Gould 1994, v).

Among other independent variables, quality of governance is positively related to environmental sustainability and is consistent with the arguments of political elasticity theory, but has no statistical confirmation. The variables of democracy and global economic integration reveal interesting patterns in this region. Contrary to the *a priori* expectations, democracy is negatively associated with the dependent variable without statistical significance, while global economic integration has some positive, but weak influence on environmental sustainability. These results support the proponents of anti-democracy environmentalism and World Bank's neoclassical economic frame over the arguments of pro-democracy environmentalism and anti-globalist movement.

The overall results, unlike the findings of multivariate analysis for all sample countries, suggest that economic conditions are more likely to explain the variations of environmental sustainability than social and political conditions. This result is also consistent with the finding of bivariate analyses. Accordingly, equation 2-8 can be chosen the best model for delineating environmental sustainability analysis for the case of Asia. The justification includes statistical significance for the parameter estimate of economic growth (p=0.05); the highest adjusted R^2 of .33; and the lowest RMSE of 5.38. It explains 33 percent of the variation of the different degree of environmental sustainability achievement in Asian countries.

Multivariate Analysis for Latin America and the Caribbean

Table 5.11 contains the eight best environmental sustainability models for Latin America and the Caribbean and shows various combinations of the dependent and independent variables. The diagnostic testing performed on the equations reveals no serious problem. The test of variance of the disturbance terms, overall, shows no strong evidence of heteroscedasticity, neither does the test of autocorrelation in the residuals. And also, the test for normality reveals little evidence to suggest rejecting the null hypothesis.

Parameter estimates of equations 1 to 8 indicate that the variables of quality of governance and economic growth have some effect on the dependent variable, environmental sustainability. On the one hand, the quality of governance variable is consistently positive and statistically significant from equations 5, 8, 4 and 7 (p=0.01 for former two; p=0.05 for latter two) and has a mild problem with the VIF score (6.30 for the equation 1). On the other hand, contrary to the *a priori* expectations, the variable of economic growth is consistently positive and has four parameter estimates with statistical significance (p=0.05 for equations 6 and 8; p=0.1 for equations 2 and 5). The highest VIF (2.36) of economic growth variable is satisfactory. Unlike the previous two cases, these results suggest three interesting points as follows: 1) there

Table 5.11. Results of Parameter Estimates of the OLS Regression for Latin America and the Caribbean

		3-1	3-2	3-3	3-4	3-5	3-6	3-7	3-8
QG	b	8.59	6.54	8.94	10.44*	8.21**	6.98	9.25*	7.22**
	s.e.	7.92	5.40	7.74	5.89	3.70	5.29	5.29	3.25
	β	0.47	0.37	0.48	0.57	0.46	0.39	0.50	0.41
	vif	6.30	3.46	6.27	3.69	1.71	3.42	3.12	1.37
DEM	b	0.51	0.58	0.06			0.06		
	s.e.	1.41	1.33	1.19			1.11		
	β	0.12	0.14	0.01			0.01		
	vif	3.67	3.82	2.71			2.74		
EG	b	1.29	1.70*	1.40	1.22	1.68*	1.84**	1.39	1.83**
	s.e.	1.13	0.85	1.09	1.08	0.83	0.82	1.01	0.78
	β	0.30	0.40	0.32	0.28	0.40	0.43	0.32	0.43
	vif	2.36	1.50	2.30	2.29	1.49	1.43	2.10	1.37
GEI	b	-0.05	-0.06		-0.04	-0.04			
	s.e.	0.09	0.09		0.08	0.07			
	β	-0.13	-0.15		-0.09	-0.10			
	vif	1.62	1.74		1.20	1.25			
PG	b	0.01		-0.08	0.26			-0.03	
	s.e.	3.24		3.16	3.07			2.94	
	β	0.00		-0.00	0.02			-0.00	
	vif	0.05		2.05	1.96			1.89	
Constant		21.97	24.72***	23.85	21.97	26.10***	26.55***	23.75	26.67
R^2		.58	.56	.57	.57	.55	.54	.57	.54
adj. R^2		.43	.45	.45	.46	.47	.46	.49	.49
RMSE		6.58	6.36	6.45	6.39	6.20	6.27	6.24	6.09

* = $p < 0.10$; ** = $p < 0.05$; *** = $p < 0.01$

is no single dominant determinant to explain the variations of environmental sustainability in this region; 2) although political elasticity theory and IUP hypothesis frame provide some explanations for the degree of environmental sustainability, their arguments are marginal; and 3) more importantly, the case of Latin America and the Caribbean reveals more complexity of intertwined patterns of the environment, politics and economy.

Among other independent variables chosen, democracy variable has stable and positive impact on the dependent variable but fails to have statistical significance. This result also suggests some support to pro-democracy environmentalism. Global economic integration variable, as expected, is negatively associated with environmental sustainability, while population growth variable has little effect on the dependent variable since the relational patterns are instable through the equations. The highest VIF of both variables is acceptable level (2.05). This result suggests some support for the proponents of anti-globalist movement in research of the environment in this region.

The overall results suggest that socio-political and economic conditions as a whole should be given attention to explain the degree of environmental sustainability rather than any single factor in the studies of the environment. This result from multivariate analysis is also consistent with the results of previous bivariate analyses. Consequently, equation 3-8 can be chosen the best model for delineating environmental sustainability analysis for this region. The justification includes statistical significance for two parameter estimates of national governance quality and economic growth rate p=0.05 for both); the highest adjusted R^2 of .49; and the lowest RMSE of 6.09. It explains 49 percent of the variation of the different degree of environmental sustainability achievement in the case of Latin America and the Caribbean.

Multivariate Analysis for the Middle East and North Africa

Table 5.12 contains the eight best environmental sustainability models for the Middle East and the North Africa and shows various compositions of the dependent and independent variables. The diagnostic testing performed on the equations reveals no serious problem. For the variance of the disturbance terms, overall, the results show no strong evidence of heteroscedasticity. Also, there is little evidence of autocorrelation in the residuals. The test for normality reveals little evidence to suggest rejecting the null hypothesis.

Parameter estimates of equations 1 to 8 indicate that the variable of democracy is the greatest determinant for explaining the variations of environmental sustainability in the case of this region. This variable is consistently positive and statistically significant for five models and has an acceptable highest VIF score (1.71). This result suggests some support to the proponents of pro-democracy environmentalism, which argues that “spread of democracy” is a prerequisite for the achievement of better environmental policies (Rodgers 1995, 41). However, the relationship of democracy to environmental sustainability has somewhat weak characteristics since the equations of democracy are not stable in statistical confirmation.

Table 5.12. Results of Parameter Estimates of the OLS Regression for the Middle East and North Africa

		4-1	4-2	4-3	4-4	4-5	4-6	4-7	4-8
QG	b	-0.58	0.46		0.22	4.84			
	s.e.	2.98	2.58		3.19	2.60			
	β	-0.06	0.05		0.02	0.63			
	vif	3.70	1.41		1.28	2.32			
DEM	b	1.45**	1.37**	1.40***	1.01	0.78	1.41**	1.41**	1.03
	s.e.	0.46	0.54	0.32	0.73	0.48	0.48	0.46	0.63
	β	0.73	0.68	0.70	0.46	0.42	0.71	0.70	0.47
	vif	1.71	1.21	1.03	1.19	1.39	1.03	1.03	1.00
EG	b	1.53*	0.37	1.45**				0.42	
	s.e.	0.69	0.65	0.49				0.55	
	β	0.49	0.15	0.47				0.17	
	vif	1.62	1.23	1.03				1.00	
GEI	b	0.00		-0.02		-0.33*	-0.01		
	s.e.	0.17		0.09		0.14	0.14		
	β	0.00		-0.04		-0.67	-0.02		
	vif	3.47		1.34		1.81	1.34		
PG	b	-2.84	-2.06	-2.70**	0.64		-2.37	-2.07	0.62
	s.e.	1.23	1.14	0.87	0.95		1.30	1.05	0.86
	β	-0.61	-0.45	-0.58	0.21		-0.50	-0.45	0.21
	vif	2.23	1.03	1.40	1.08		1.38	1.03	1.00
Constant		36.68***	36.01***	36.05***	31.37***	31.44***	39.84***	36.66***	31.81***
R^2		.87	.87	.87	.68	.65	.65	.87	.65
adj. R^2		.71	.77	.77	.52	.48	.48	.80	.56
RMSE		2.63	5.55	5.61	11.72	12.81	12.64	4.72	10.86

* = $p < 0.10$; ** = $p < 0.05$; *** = $p < 0.01$

Among other independent variables, the variable of governance quality is inconsistently related to environmental sustainability. This result reveals that the arguments of political elasticity theory have little explanatory power in this region. Contrary to the *a priori* expectation, the economic growth variable is positively and consistently associated with the dependent variable. This result supports the proponents of IUC hypothesis frame without statistical confirmation. The variables of global economic integration and population growth also show weak and inconsistent characteristics. In other words, these two variables have little explanatory power for the variations of environmental sustainability in the Middle East and North Africa.

Unlike the findings of previous three cases, the overall results suggest that social and economic conditions are more likely to explain the variations of environmental sustainability than political conditions in this region. This result, however, shows slightly different patterns from the findings of bivariate analyses, which reveal that social and political conditions are equally important factors to explain the degree of environmental sustainability. Accordingly, the equation 4-3 can be chosen the best model for delineating environmental sustainability analysis for the case of the Middle East and North Africa. The justification includes statistical significance for the parameter estimates of democracy (p=0.01), economic growth (p=0.05) and population growth (p=0.05); the second highest adjusted R^2 of .77; and the RMSE of 5.61. It explains 77 percent of the variation of the different degree of environmental sustainability achievement in Middle East and North African countries.

Multivariate Analysis for Sub-Saharan Africa

Table 5.13 contains the eight best environmental sustainability models for Sub-Saharan Africa and shows various combinations of the dependent and independent variables. The diagnostic testing performed on the equations reveals no serious problem. The test of variance of the disturbance terms, overall, shows no strong evidence of heteroscedasticity, neither does the test of autocorrelation in the residuals. And also, the test for normality reveals little evidence to suggest rejecting the null hypothesis.

Parameter estimates of equations 1 to 8 indicate that there is no single dominant determinant to explain the variations of environmental sustainability in the region of Sub-Saharan Africa. This result shows a similar pattern with the case of Latin America and the Caribbean. The variable of quality of governance is consistent and positive relationship with the dependent variable although there is no statistical confirmation. This result suggests some support the proponents of political elasticity theory with marginal mold. As expected, the democracy variable is also consistently and positively related to environmental sustainability, but the relationship is weak. Contrary to the *a priori* expectations, the variables of economic growth and global economic integration are positively associated with the dependent variable, and the relational patterns are consistent across all equations. These results reveal that IUC hypothesis and World Bank's neoclassical economic frames have a limited explanatory power for the dynamic of environmental sustainability in the region. The population growth variable is also in the

Table 5.13. Results of Parameter Estimates of the OLS Regression for Sub-Saharan Africa

		5-1	5-2	5-3	5-4	5-5	5-6	5-7	5-8
QG	b	2.77	3.57		4.99	4.31	4.43	5.72	
	s.e.	6.07	5.28		4.84	4.35	3.73	3.99	
	β	0.18	0.23		0.32	0.27	0.28	0.37	
	vif	3.94	3.15		2.59	2.15	1.66	1.86	
DEM	b	0.17		0.30	0.16	0.03			
	s.e.	0.60		0.52	0.59	0.57			
	β	0.07		0.12	0.07	0.01			
	vif	1.65		1.32	1.65	1.57			
EG	b	0.51	0.50	0.72		0.34	0.34		0.84
	s.e.	0.81	0.78	0.64		0.70	0.68		0.59
	β	0.16	0.16	0.23		0.10	0.10		0.27
	vif	1.74	1.74	1.15		1.37	1.37		1.03
GEI	b	0.18	0.18	0.23*	0.14	0.19	0.19	0.13	0.26**
	s.e.	0.18	0.17	0.13	0.16	0.11	0.11	0.16	0.12
	β	0.29	0.29	0.38	0.22	0.35	0.35	0.22	0.42
	vif	0.08	2.07	1.19	1.77	1.25	1.25	1.77	1.02
PG	b	-3.68	-3.40	-4.72	-2.66			-2.40	-4.76
	s.e.	4.11	3.89	3.34	3.71			3.50	3.28
	β	-0.21	-0.20	-0.28	-0.15			-0.14	-0.28
	vif	1.46	1.39	1.02				1.16	1.02
Constant		40.90**	39.78**	47.51***	35.33**	28.36***	28.35***	34.35**	49.20***
R^2		.35	.35	.34	.33	.35	.35	.33	.33
adj. R^2		.15	.19	.19	.18	.20	.24	.22	.22
RMSE		6.13	5.97	5.99	6.02	5.99	5.83	5.87	5.87

* = $p < 0.10$; ** = $p < 0.05$; *** = $p < 0.01$

expected direction. One interesting finding in this result is that all determinants chosen in this study have positive and consistent relationships with the dependent variable. This implies that socio-political and economic conditions of Sub-Saharan African countries are below the world average, and institutional and infra-structural conditions should be achieved prior to ameliorating the condition of environmental sustainability.

This overall result is consistent with the findings of bivariate analyses, although there are slightly different emphases on political and international conditions in bivariate results. Consequently, the equation 5-5 can be chosen the best model for delineating environmental sustainability analysis for this region. The justification includes the consideration of all socio-political and economic variables in spite of relatively low value of adjusted R^2 .20; the highest R^2 value of .35; and relatively low value of RMSE, 5.99. It explains 20 percent of the variation of the different degrees of environmental sustainability achievement in the case of Sub-Saharan African countries.

Multivariate Analysis for East and Central Eurpoe

Table 5.14 contains the eight best environmental sustainability models for East and Central Europe and shows various compositions of the dependent and independent variables. The diagnostic testing performed on the equations reveals no serious problem. The test of variance of the disturbance terms indicates little evidence of heteroscedasticity. And also, the tests of autocorrelation and normality in the residuals reveal little evidence to suggest rejecting the null hypotheses.

Parameter estimates of equations 1 to 8 indicate that the variable of global economic integration is the greatest determinant for explaining the variations of environmental sustainability in the case of this region. This variable is consistently positive and statistically significant through all equations, and has acceptable highest VIF score (3.27). This result suggests strong support for the proponents of World Bank's neoclassical economic frame and pro-globalist movement, which is consistent to the theoretical orientation of Bommer's simple general equilibrium model applied to explanation of the impact of NAFTA on the United States. According to him, whereas trade liberalization may increase environmental disruptions in the short term, its impact on stakeholders' attitudes may later trigger a tightening of environmental standards. For instance, if the export sector that benefits from trade liberalization is a larger polluter than the import sector, a tightening of environmental regulations could, in the next stage, reverse or mitigate the initial damages (Bommer 1998).

Among other independent variables, the governance quality variable is inconsistently related to the dependent variable. This result implies that the proponents of political elasticity theory have no explanatory power in this region. As expected, democracy variable is consistently and positively related to environmental sustainability although it has no statistical confirmation. Contrary to the *a priori* expectation, economic growth variable is consistently and positively associated with the dependent variable. It suggests some support to IUC hypothesis frame to analyze the degree of environmental sustainability in the case of

Table 5.14. Results of Parameter Estimates of the OLS Regression for East and Central Europe

		6-1	6-2	6-3	6-4	6-5	6-6	6-7	6-8
QG	b	-6.28	-6.56		-1.71	-2.03	1.03		
	s.e.	6.82	6.43		5.90	5.73	3.77		
	β	-0.46	-0.48		-0.12	-0.15	0.07		
	vif	10.53	10.02		7.59	7.51	3.23		
DEM	b	1.09	1.09	0.51	0.68	0.64		0.45	0.52
	s.e.	0.79	0.76	0.46	0.73	0.71		0.43	0.46
	β	0.47	0.47	0.22	0.29	0.28		0.19	0.22
	vif	4.92	4.92	1.75	4.10	4.04		1.58	1.75
EG	b	0.39	0.49	0.24			0.23	0.26	
	s.e.	0.31	0.29	0.26			0.27	0.25	
	β	0.25	0.26	0.15			0.15	0.16	
	vif	1.66	1.55	1.19			1.28	1.16	
GEI	b	0.35**	0.35**	0.28**	0.33**	0.33**	0.30**	0.27**	0.31***
	s.e.	0.13	0.12	0.09	0.13	0.12	0.12	0.09	0.09
	β	0.77	0.77	0.60	0.73	0.72	0.65	0.58	0.67
	vif	3.27	3.27	1.87	3.22	3.21	2.95	1.76	1.65
PG	b	0.30		0.64	0.82				0.87
	s.e.	1.64		1.59	1.62				1.56
	β	0.03		0.07	0.09				0.10
	vif	1.46		1.39	1.37				1.36
Constant		45.88***	46.64***	38.13***	38.10***	39.43***	39.94***	39.01***	36.29***
R^2		.66	.66	.64	.62	.61	.61	.64	.62
adj. R^2		.54	.57	.54	.52	.54	.54	.57	.55
RMSE		5.16	5.00	5.14	5.27	5.15	5.16	5.00	5.12

* = p < 0.10; ** = p < 0.05; *** = p < 0.01

East and Central Europe. The population growth variable is also positively related to the dependent variable, which is opposite to the *a priori* expectation.

Unlike the cases of the other regions, the overall results suggest that social and economic conditions are more likely to explain the variations of environmental sustainability than political conditions in this region. Interestingly, this result is not consistent with the finding of bivariate analyses, in which socio-political and economic conditions equally determine the dynamics of environmental sustainability in the region. Accordingly, the equation 6-2 can be chosen the best model for delineating environmental sustainability analysis in the case of East and Central Europe. The justification includes statistical significance for the parameter estimate of global economic integration ($p=0.05$); the highest adjusted R^2 of .57; and the lowest RMSE of 5.00. This model explains 57 percent of the variation of the different degree of environmental sustainability achievement in East and Central European countries.

Multivariate Analysis for the OECD

Table 5.15 contains the eight best environmental sustainability models for OECD member states and shows various combinations of the dependent and independent variables. The diagnostic testing performed on the equations reveals no serious problem. In regard to the variance of the disturbance terms, the results show no strong evidence of heteroscedasticity. Also, there is little evidence of autocorrelation in the residuals. The test for normality reveals little evidence to suggest rejecting the null hypothesis.

Parameter estimates of equations 1 to 8 indicate that the variable of quality of governance is the most important determinant to explain the variations of environmental sustainability. This variable is consistently positive and statistically significant through all equations ($p=0.01$) and has acceptable highest VIF score (6.79). This result confirms the proposed hypothesis in this study and implies that improvement of national governance quality leads to changes in exercising power patterns that positively impact the efficiency and effectiveness of environmental policies as well as governmental process, capacity and interactions with the public. This is consistent to the theoretical expectation of political elasticity theory.

Among other independent variables chosen, the democracy variable is inconsistently related to the dependent variable. It reveals that the democratic factor has little effect on the debates of environmental sustainability. Indeed, all OECD member states are categorized as democratic societies by Freedom House (Freedom House 2000). As expected, the variables of economic growth and global economic integration are consistently and negatively related to the dependent variable although the former has some statistical significance. These results suggest some support for the arguments of LG hypothesis frame and anti-globalist movement over those of IUC hypothesis frame and pro-global environmentalism. However, the population growth variable is positively associated with the dependent variable.

The overall results suggest that political and economic conditions are more likely to explain the degree of environmental sustainability than social conditions. This result is, in general, also consistent with the results of previous bivariate analyses, although there are slightly different emphases on conditions.

Table 5.15. Results of Parameter Estimates of the OLS Regression for the OECD

		7-1	7-2	7-3	7-4	7-5	7-6	7-7	7-8
QG	b	17.23***	17.30***	21.53***	16.09***	19.00***	20.31***	17.44***	16.60***
	s.e.	5.71	2.51	4.68	5.20	5.85	4.41	2.60	2.12
	β	0.86	0.86	1.08	0.80	0.95	1.01	0.87	0.83
	vif	6.79	1.37	4.44	5.80	6.58	3.99	1.37	1.00
DEM	b	0.02		-1.67	0.21	-0.60	-1.63		
	s.e.	2.06		1.59	2.00	2.11	1.58		
	β	0.00		-0.23	0.03	-0.08	-0.22		
	vif	6.86		3.99	6.66	6.65	3.99		
EG	b	-1.46*	-1.46*	-0.95	-1.57		-1.04	-0.79	-1.56*
	s.e.	0.84	0.81	0.75	0.80		0.73	0.73	0.78
	β	-0.22	-0.22	-0.14	-0.24		-0.16	-0.12	-0.23
	vif	1.39	1.34	1.07	1.31		1.04	1.03	1.28
GEI	b	-0.02	-0.02	-0.03		-0.04		-0.03	
	s.e.	0.04	0.04	0.04		0.04		0.04	
	β	-0.07	-0.07	-0.10		-0.12		-0.10	
	vif	1.48	1.44	1.40		1.40		1.40	
PG	b	3.98	3.95		4.35	1.38			4.15*
	s.e.	3.11	2.33		2.99	2.85			2.27
	β	0.21	0.21		0.23	0.07			0.22
	vif	2.25	1.31		2.14	1.73			1.28
Constant		2.79	2.93	11.65	3.12	3.89	13.51	3.91	4.21
R^2		.72	.72	.70	.71	.68	.69	.68	.71
adj. R^2		.66	.67	.65	.67	.63	.65	.65	.68
RMSE		6.54	6.41	6.63	6.44	6.81	6.59	6.64	6.31

* = $p < 0.10$; ** = $p < 0.05$; *** = $p < 0.01$

Consequently, the equation 7-8 can be chosen the best model for delineating environmental sustainability analysis for this category. The justification includes statistical significance for three parameter stimates of national governance quality (p=0.01), economic growth (p=0.10) and population growth rate (p=0.10); the highest adjusted R^2 of .68; and the lowest RMSE of 6.31. It explains 68 percent of the variation of the different degree of environmental sustainability achievement in the case of OECD member states.

Multivariate Comparisons of Regional Analyses

Table 5.16 summarizes the statistic results of Table 5.9 through 5.15 and shows multivariate comparisons of all sample countries and six regional-economic categorizations. The case of all sample countries statistically confirms *a priori* expectations of this study[85] and the main proposed hypothesis that the more quality of governance, the more environmental sustainability. The regional variations of determinant to explain the environment, however, show that different conditions of each category should be given attention.

For the case of Asia, the economic growth is the main determinant and negatively relates to the sustainability. This result implies that rapidly economic expansion and growth of East and Southeast Asian countries, in particular, eventually hinder environmental sustainability, and the economic functions in the environment should be given priority for further studies. The case of Latin America and the Caribbean shows that there is no predominant determinant to explain the variations of the sustainability; instead, this region reveals more complexity of intertwined patterns of the environment, politics and economy. The case of the Middle East and North Africa shows that political democratization, economic growth programs and reinforcement of global economic integration are equally important to explain the sustainability, and further studies should be given attention these factors. The case of Sub-Saharan Africa shows that governmental and institutional arrangement along with development of social, economic and international corporations should be emphasized to ameliorate the environment. This statistic result also confirms the fact that all conditions of this region are below the world average. For the case of East and Central Europe, the global economic integration variable is the most important determinant to explain the sustainability. This result also reflects the fact that the former communist countries in this region have been accelerating global economic integration and international corporation after the collapse of Berlin Wall and trying to meet the Western European criteria of the environment, which is one of the most important barometer to become a member state of European Union. Finally, the case of the OECD states confirms *a priori* expectations of explanatory variables in this study. The statistic result suggests that the case of the OECD is similar to the case of all sample countries. However, population growth does not hinder environmental sustainability in this category.

[85] For the details, see Table 1.1 in Chapter One.

Table 5.16. Multivariate Comparisons of Regional Analyses

	All Sample	Asia	LAC	MENA	SSA	ECE	The OECD
	ES	ES	ES	ES	ES	ES	ES
QG	+***	+	+	-	+	-	+***
DEM	+**	-	+	+**	+	+	+
EG	-	-*	+	+	+	+	-*
GEI	-	+	-	+	+	+**	-
PG	-*	-	+	-	-	+	+
adj. R^2	.66	.21	.43	.71	.15	.54	.66

* = p < 0.10; ** = p < 0.05; *** = p < 0.01

ES (Environmental Sustainability)
QG (Quality of Governance)
DEM (Democracy)
EG (Economic Growth)
GEI (Global Economic Integration)
PG (Population Growth)
LAC (Latin America and the Caribbean)
MENA (the Middle East and North Africa)
SSA (Sub-Saharan Africa)
ECE (East and Central Europe)
OECD (Organization for Economic Cooperation and Development)

4. Summary

In this chapter we proposed seven correlation matrixes and fifty six environmental sustainability models and discussed the results and their implications, using bivariate descriptive statistics and OLS regressions. The dynamics of environmental sustainability is hypothesized to be influenced by five independent variables, which are drawn from competing theories and arguments on the debates of the environment. The variables include quality of governance, the level of democracy, economic growth rate, the level of global economic integration and population growth rate.

The overall results suggest five important points. First, technically the data set used in this study is well qualified through rigorous diagnostic tests, so that the results have a guarantee of reliability and validity. Second, although there are a few exceptions based on regional analyses, the variable of national governance quality is the most important determinant for explaining the variations of environmental sustainability studies. This result statistically confirms the main proposition of the study, which notes that the quality of national governance is intrinsically related to, and even generates pressure for, environmental sustainability. Third, the results of bivariate and multivariate analyses are consistent and provide similar patterns of analytical descriptions. These results also fortify the reliability and validity of the proposed environmental sustainability models. Forth, although often depicted as conflicting and incompatible theories of environmental sustainability, the results of data analyses and models imply that the proponents of pro-democracy and anti-democracy environmentalisms, LG and IUC hypotheses frames, pro-globalist and anti-globalist movements are not incompatible, but rather complementary. And, last and most importantly, the general results of empirical analyses suggest that further research should tend to a combination of comparative case studies with cross-national and longitudinal research. Beyond either particularistic case studies or generalizing cross-national studies of the environment, environmental studies should encompass the complex process of social, political, economic and international conditions and their interactions.

In the next chapter, summarizing a brief overview of the study, we offer concluding observations and implications on both theory and future of environmental politics. And finally, recognizing potential limits of the study, we suggest some guides to further research of governance and environmental sustainability.

Chapter Six. Comparative Analyses and Conclusion

1. Overview

The complex web of interrelations among global and national governance, public policies, and environmental and socio-economic issues have required scholarly attention as the environment becomes the focus of international concern in the new century. Although the term "sustainable development" or "environmental sustainability" dates back to the 1970s, accompanied by liberal democracy and free markets, sustainable development is now a pillar of contemporary universalism, embraced from the industrialized north, to the less-developed south, to the post-communist east. The concept of global environmental change arises from concerns about the sustainability of an "earth transformed" and has led to international mandates and protocols seeking to reduce the changes in question. It complements sustainable development by elevating issues of "sustainable" to the biosphere itself and those of "development" to humankind over the long term (Clark and Munn 1986).

The sustainability principle has been accepted at the highest levels of decision and policy making. Woven into the fabric of international agendas, it blurs the distinctions between environment and development and fosters a fusion of sustainable development and global change research. This fusion, however, creates a paradox that may be resolved not only by reframing the meaning of sustainable and, hence, the sustainability principle but also recapturing the dynamics of environmental politics. In the recent literature on environmental sustainability, lack of good governance is cited as one of the factors that either caused or contributed to the prolonged national environmental degradations. The literature also highlights the possible links between good governance, economic stability, and environmental sustainability. Greater government capacity and wider openness enable the public to make informed political decisions, improve the accountability of governments, and reduce the scope for environmental degradation.

This study, accordingly, started with recognizing three research questions. First, what determines the level of environmental sustainability in national level analyses? Second, how can the quality of governance be defined, measured and applied in the dynamics of political processes? And third, how does the quality of governance influence the level of environmental sustainability? For the first question, this study articulates four predicting variables (quality of governance, democracy, economic growth rate and the level of global economic integration) and one control variable (population growth rate) to render an explanation of the different levels of achievement of environmental sustainability among nation-states. The variables are selected on the basis of competing theories and arguments of previous environmental studies. For the second, this study defines the quality of governance as an institutional framework of government. In other words, it is traditions and institutions that determine how authority is exercised in a particular country. The concept of governance, therefore, encompasses governmental processes, capacities and interactibility with the public. For the last question, using new sets of data on environmental sustainability

and governance, this study examines and argues critically the thesis that the quality of governance is intrinsically related to, and even generates pressure for, environmental sustainability.

Through the theoretical orientations, this study introduces competing arguments of previous environmental research. First, there are two controversial arguments regarding the impact of democracy on the environment. Pro-democracy environmentalism, on the one hand, argues that the spread of democracy is a prerequisite for the achievement of better environmental policies and more likely to protect the global environment. This clout is based on the fact that the extent and intensity of ecological damage in the former Soviet bloc and in most totalitarian and authoritarian states are significantly greater. On the other hand, the rationale of anti-democracy environmentalism is that liberal democracy's stress on individual liberty and private property eventually promotes ecological catastrophe. This argument laments (1) the freedom of individuals to pollute, consume and procreate and (2) the inability of limited government to control the "tragedy of the commons."

Second, there are two debates on what is the relationship between expanding human economy and environmental sustainability. On the one hand, in the view of the LG (Limits-to-Growth) hypothesis, limits are seen as absolute constraints on economic activity, not just as a point beyond which economic growth results in environmental destruction. This concept of limits is a common theme, from limits on arable land, to energy and material limits, to the economic scale and thermodynamic limits proposed by ecological economists. On the other hand, the IUC (Inverted U-Curve) hypothesis contends that substantial evidence points to an IUC relationship between per capita income and various types of pollutions and the level of environmental sustainability, suggesting that while the early stages of economic growth causes the problem of the environment, later ones bring the remedy.

The third debate is about the influence of globalization on the level of environmental sustainability. The question here is whether or not international economic factors such as free trade and financial interdependence among nation-states encourage domestic government interest in positive environmental policy. In a notable deviation from its traditional support of neoclassical economic frameworks for development in the Third World, MDBs argue that global economic integration and international trade increase long-term environmental protection. Their rationales are that trade liberalization may, for instance, reduce market failures, which are responsible for inefficient allocation of scarce resources and for wasting environmental resources. Trade liberalization can also facilitate the diffusion of "greener" technologies. In other cases, economic liberalization can trigger a reaction to "environmental dumping" through the systematic exploitation of comparative advantages based not on an intrinsically higher efficiency of the economic system, but rather on the externalization of environmental costs allowed by current environmental regulations. On the other hand, for proponents of the anti-globalist movement, the environment is in an enduring conflict with the expansion of global economic and financial integration. This trend of globalization requires the exploitation of natural resources for expanding production of material goods and dumping of the waste products of this production into the environment. The modern

"treadmill of production" inexorably degrades the environment. In MDCs, mass production and consumption of export-oriented developmental strategy are a major cause of environmental degradation and destruction of natural resources. In LDCs, the creation of value and access to subsistence are typically linked to sacrificing environmental quality for short-term economic gain.

Being aware of this inconclusiveness and the nature of multifaceted characteristics of environmental sustainability, this study proposes political elasticity theory as a political and institutional condition for articulating the determinant of the level of environmental sustainability. Bringing the concepts of governance and political software to the debate, the theory consists of the following five propositions (Werlin 2000, 439-42; Wolin 1960, 10-1, 434). First, the more governments or those in authority can integrate and alternate soft forms of political power, linking incentives to persuasion, with hard forms of power, including disincentives and coercion, the more effective they will be. Second, as leaders integrate and alternate soft and hard forms of power, their political power takes on "rubber band" and "balloon" characteristics, allowing them (1) to decentralize or delegate power in various ways without losing control; (2) to expand their influence, reliably and predictably affecting the behavior of wider circles of citizens, participants, and subordinates; and (3) to adjust their capacities in the face of anomalies. Third, political elasticity depends partly on the selection of appropriate political hardware, including "objective" forms of organization, but mostly on political software, recognizing the "subjective" quality of relationships between a government and its citizens. In other words, political software articulates the interrelationships between leaders and followers, while political hardware implies an "objective" form of organization, regulation, procedure, and technology. Fourth, political software can be made more effective in the commonsens ways suggested by typical public administration and business administration studies. They include establishing acceptable goals, hiring qualified personnel, delegating responsibility, stimulating motivation and competition, encouraging training, paying attention to morale, expanding two-way flows of communication, promoting legitimacy, maintaining supervision, protecting independent spheres of authority, cultivating contractors, and developing conflict-resolution procedures. These steps are increasingly referred to as "good governance." And last, the enhancement of political software requires a balancing of the two meanings of political power identified by Wolin: the struggle for competitive advantage (partisanship) and the struggle for consensus (statesmanship).

In summary, based on the competing theories and arguments of the environmental phenomena, this study is, accordingly, examining the determinants of environmental sustainability with cross-national statistical comparisons using national aggregates from 122 countries and arguing that the level of environmental sustainability is largely due to the degree of good governance measured by six indicators: government accountability, political stability, government effectiveness, regulatory framework, rule of law and corruption control.

2. Comparative Analyses and Implications

Testing and discussing empirical hypotheses and results, we have established that the causal variables for explanations of the dynamics of environmental sustainability rely on not only domestic factors but also international conditions. And we have revealed that the multifaceted characteristics and patterns of the achievement of environmental sustainability are also idiosyncratic and idographic based on each individual nation-state and on each categorized region.

Several important conclusions and implications for both the theories and policies emerge from the results of the testing and discussions. First, political elasticity theory has a great explanatory power for the different achievements of environmental sustainability in the sample countries in general, and in the cases of Latin America and the Caribbean and OECD member states in particular. It implies that institutional arrangements of governance and improvement of governmental processes, capacities and interactibilities with the public are the most important key task for ameliorating environmental policies and sustainability. This result also brings "politics" back to the stage of environmental discussions in which environmental engineering and economic calculations of environmental externality have predominated so far.

Second, the level of democracy consistently has a positive impact on the environment with the exception of the Asian case. This result demonstrates two important implications. First, social conditions such as political rights and civil liberties should be a prerequisite for achieving environmental sustainability. Second, from the high level of establishment of the sustainability in Asian countries, Asian authoritarian governments have proven their effectiveness and efficiency in environmental policy implementations, although their standards of democracy have yet to fit the Western criteria. This implication, indeed, sheds a light on the on-going debate on the legitimacy of "Asian style" democracy.

Third, the impacts of economic growth on the environment go in two directions. In MDCs, economic growth is negatively associated with environmental sustainability, while in LDCs the expansion of human economy is positively related to the dependent variable. It entails that developing and developed countries should have different strategies toward economic activities in regard to improving environmental sustainability. Both the frames of LG and ICU hypotheses, therefore, can be adopted in terms of the level of economic development.

Fourth, the roles of global economic integration show different patterns based on categorized regions. In Asia, Sub-Saharan Africa and East and Central Europe, the global economic integration variable promotes and sustains the level of environmental quality, while countries in Latin America and the Caribbean degrade the environment due to the consequences of global economic integration. These patterns suggest some support for different developmental strategies between Asia and Latin America. The results of the environmental analyses also have a similar implication for strategies of economic development. Traditionally, the export-oriented developmental strategy has been adopted in Asian countries, whereas Latin American countries have applied the import-oriented strategy to economic development. Moreover,

these results also reflect the current phenomenon as East and Central European countries have tried to accelerate global economic integration after the collapse of the Berlin Wall.

Finally, as a control variable of this study, population growth rate is negatively associated with environmental sustainability in most of cases, but in states of the OECD and East and Central Europe, it has a positive impact on the environment. This result suggests strong support for birth control policies in most LDCs.

3. Suggestions for Further Research

This study is merely the beginning of a research project. The cross-national design adopted in this study attempts to investigate some of the general mechanisms of environmental sustainability and its multifaceted conditions. Even though it provides some insights into these mechanisms, it says little about the particularistic paths followed by specific countries. In general, cross-national studies, like this study, focus almost exclusively on the structural component of environmental sustainability processes, neglecting agency components. On the other hand, case studies often say a lot about the agency involved in certain sustainability and how agency is able to overcome structural constraints or make use of opportunities provided by various conditions. To the extent that agency occurs along regular paths, one should be able to capture it in cross-national research.

Further research, accordingly, should try to combine cross-national studies with longitudinal and case studies to encompass the complex and multidimensional nature of environmental studies. The cross-national research can provide not only a context to interpret the case studies but also hypotheses for further studies. The incompatibility of case studies and statistical research is a mere phantom illusion. Both complement and inspire each other, capturing different aspects of the phenomenon studies.

Furthermore, although this study lends credence to the role of governance and political elasticity theory in the debates of the environment, we should admit that the concepts of two main variables, quality of governance and environmental sustainability have limits in their premature conceptualization and low level of operationalization. A trial of embodying the conceptual and operational definitions should not be ignored for better delineating the real dynamics of environmental studies. Moreover, endless efforts have to be put into improving measurement for cross-national research. It is crucial that more refined measures for quality of governance, the level of democracy and the scale of global economic integration are developed in order for cross-national research to provide a continuing contribution to this arena.

Finally, since recent case studies have again and again stressed the role of environmental technologies and short-term economic calculations in environmental research questions and their explanatory variables, further research, both comparative case studies and cross-national statistical studies should examine the nexus of multidimensional conditions in the environment with more rigorous methodological refinement, and research questions should be formulated using a combination of various determinants from comparative case studies and cross-national and longitudinal research. In so doing, one

can possibly figure out the complexity of the environmental mechanism and its consequences for our daily lives.

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Appendices

Appendix 1. List of Sample Countries

Asia	Latin America and the Caribbean	The Middle East and North Africa	Sub-Saharan Africa	East and Central Europe	OECD Member States
Bangladesh Bhutan China India Indonesia Japan Korea, Rep. Malaysia Mongolia Nepal Papua New Guinea Pakistan Philippines Singapore Sri Lanka Thailand Vietnam	Argentina Bolivia Brazil Chile Colombia Costa Rica Cuba Dominican Republic Ecuador El Salvador Guatemala Haiti Honduras Jamaica Mexico Nicaragua Panama Paraguay Peru Trinidad and Tobago Uruguay Venezuela, RB	Algeria Egypt, Arab Rep. Iran, Islamic Rep. Jordan Kuwait Lebanon Libya Mali Morocco Niger Saudi Arabia Sudan Syrian Arab Republic Tunisia	Benin Botswana Burundi Burkina Faso Cameroon Central African Rep. Ethiopia Gabon Ghana Kenya Madagascar Malawi Mauritius Mozambique Nigeria Rwanda Senegal South Africa Tanzania Togo Tunisia Uganda Zambia Zimbabwe	Albania Armenia Azerbaijan Belarus Bulgaria Croatia Czech Republic Estonia Kazakhstan Kyrgyz Republic Latvia Lithuania Macedonia, FYR Moldova Poland Romania Russian Federation Slovak Republic Slovenia Ukraine Uzbekistan	Australia Austria Belgium Canada Czech Republic Denmark Finland France Germany Greece Hungary Iceland Ireland Italy Japan Korea, Rep. Mexico Netherlands New Zealand Norway Poland Portugal Romania Slovak Republic Spain Sweden Switzerland Turkey United Kingdom United States

Appendix 2. Aggregate Governance Indicators Dataset Sources

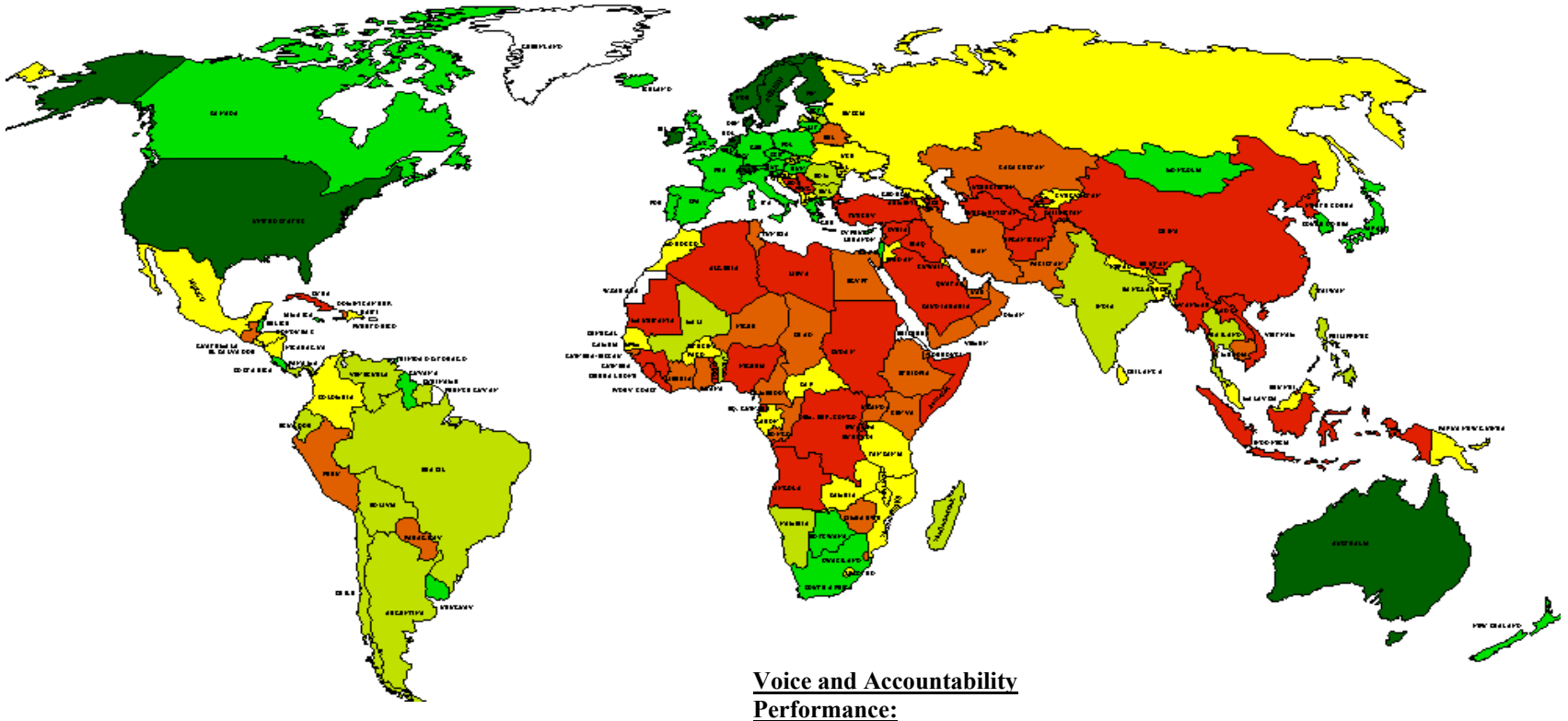
Aggregate Governance Indicators Dataset Sources:
The composite governance indicators are based on 1997-1998 data from selected variables provided by the following sources

Source Name:	Internet Address:	Publication:	Coverage:
Business Environment Risk Intelligence	www.beri.com	Business Risk Service	50 mostly developed countries
Economist intelligence Unit	www.eiu.com	Country Risk Service	114 developed and developing countries
European Bank for Reconstruction and Development	www.ebrd.com	Transition Report	26 transition economies
Freedom House	www.freedomhouse.org	Freedom in the World/Nations in Transit	172 developed and developing countries
Gallup International	www.gallup-international.com	50th Anniversary Survey	44 mostly developed countries
Institute for Management Development	www.imd.ch	World Competitiveness Yearbook	46 mainly developed countries
Political Economic Risk Consultancy	www.asiarisk.com	Asia Intelligence	11 Asian countries
Political Risk Services	www.prsgroup.com	International Country Risk Guide	140 developed and developing countries
Standard and Poor's DRI/McGraw-Hill	www.dri.standardandpoors.com	Country Risk Review	106 developed and developing countries
Wall Street Journal	http://www.wsj.com/	Central European Economic Review	27 transition economies
World Bank	www.worldbank.org	World Development Report 1997	74 developed and developing countries
World Economic Forum	www.weforum.org	Global Competitiveness Survey/Africa	77 developed and developing countries

Source: : "Governance Matters" by Daniel Kaufmann, Aart Kraay and Pablo Zoido-Lobaton, May 1999. http://www.imf.org/external/pubs/ft/fandd/2000/06/kauf.htm

Appendix 3. Illustrative Governance: Six Operational Indicators of Good Governance

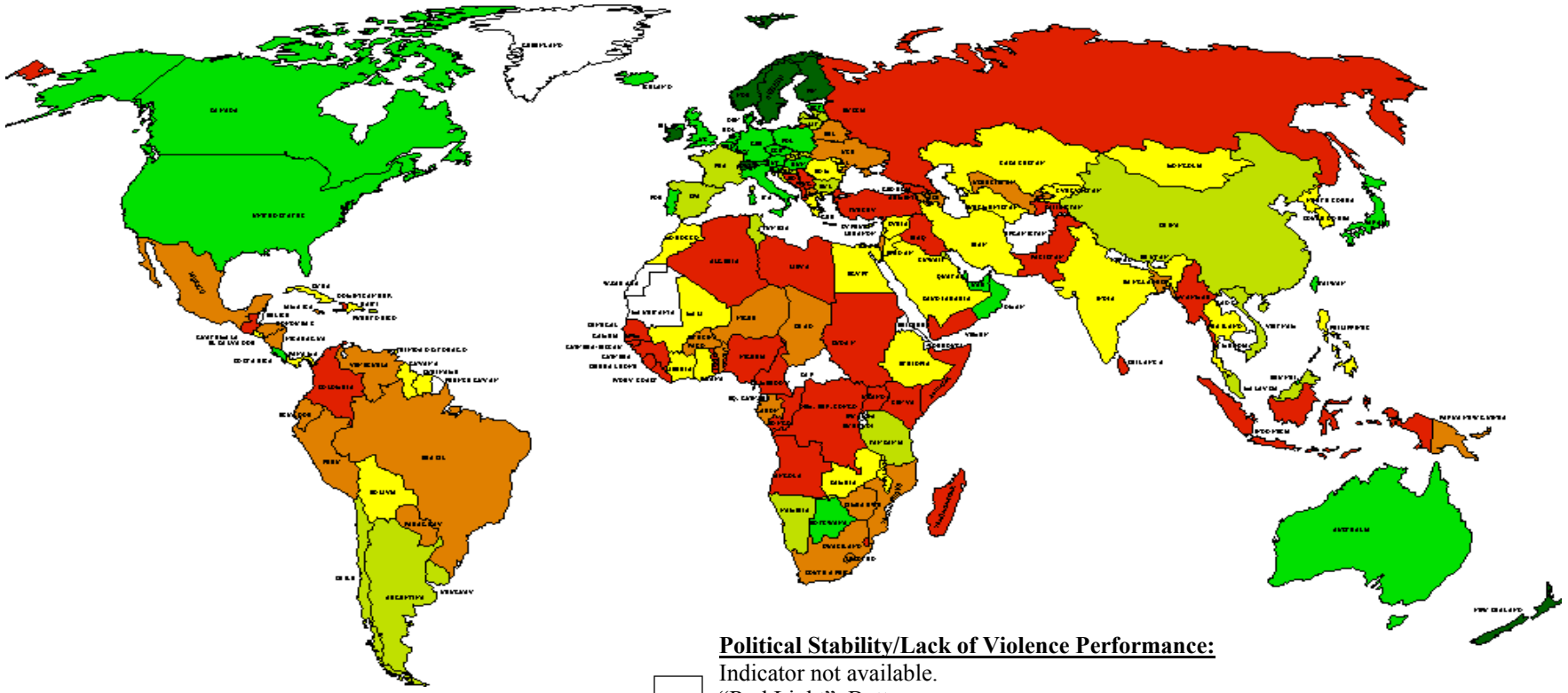
Illustrative Governance: 1. Voice and Accountability



Source: "Governance Matters" by Daniel Kaufmann, Aart Kraay and Pablo Zoido-Lobaton, May 1999.
http://www.worldbank.org/wbi/governance/gov_data.htm

Voice and Accountability Performance:
Indicator not available.
"Red Light": Bottom group.
Next-to-bottom group.
"Yellow Light": Vulnerable group.
Less vulnerable group.
"Green Light": Out of danger.

Illustrative Governance: 2. Political Stability and Lack of Violence

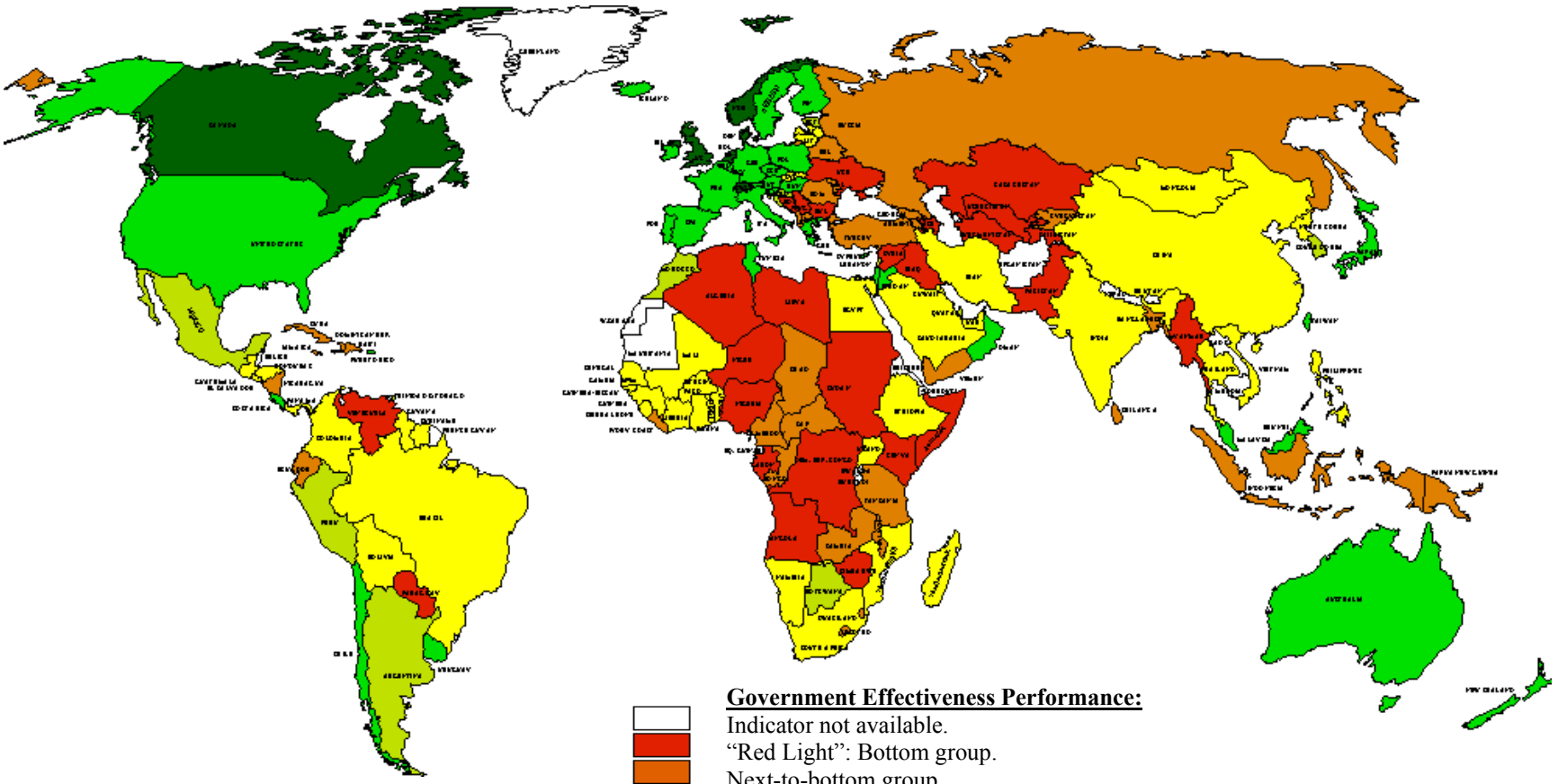


Political Stability/Lack of Violence Performance:

Indicator not available.
"Red Light": Bottom group.
Next-to-bottom group.
"Yellow Light": Vulnerable group.
Less vulnerable group.
"Green Light": Out of danger.
"Dark Green": Top 5% in the world.

Source: "Governance Matters" by Daniel Kaufmann, Aart Kraay and Pablo Zoido-Lobaton, May 1999.
http://www.worldbank.org/wbi/governance/gov_data.htm

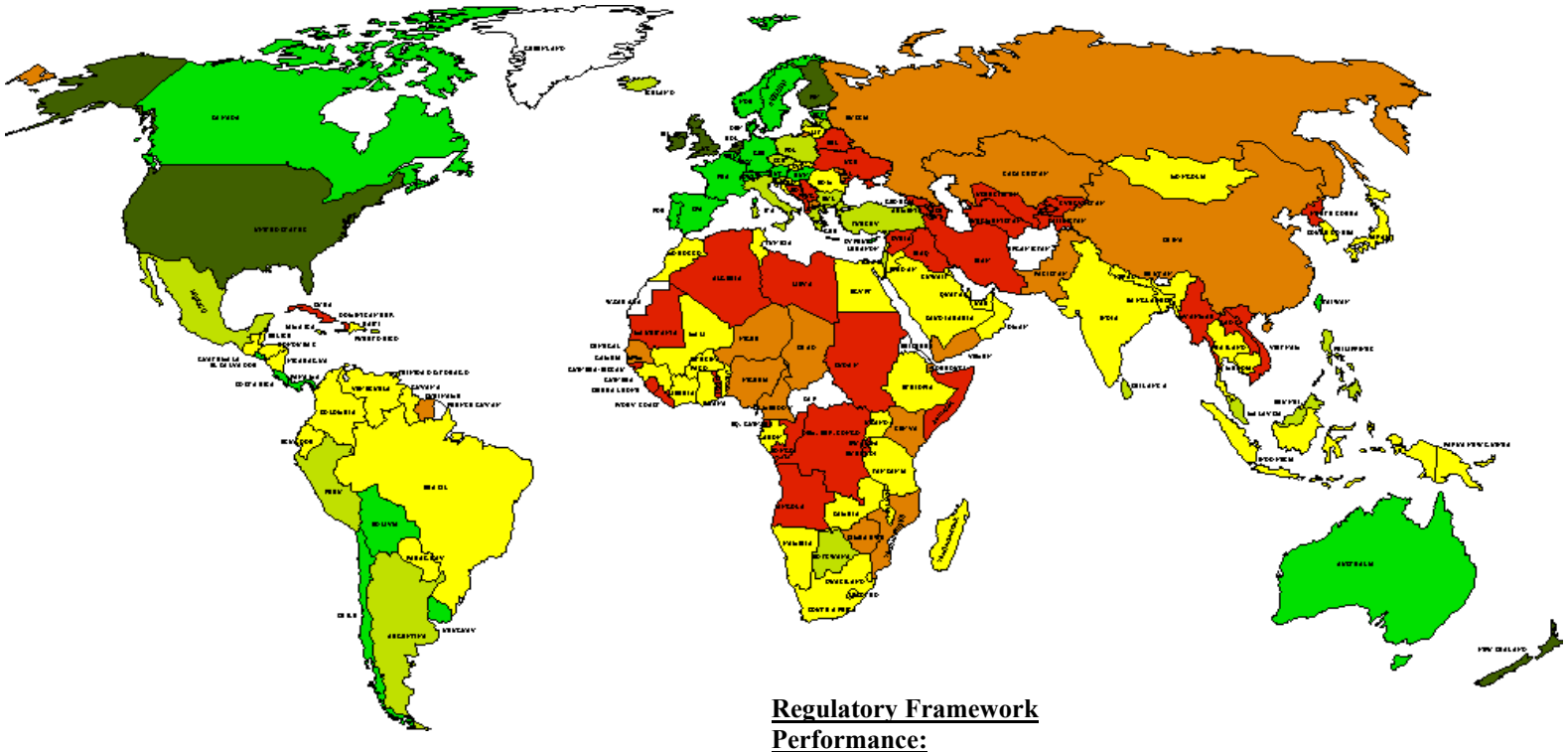
Illustrative Governance: 3. Government Effectiveness



Government Effectiveness Performance:
Indicator not available.
"Red Light": Bottom group.
Next-to-bottom group.
"Yellow Light": Vulnerable group.
Less vulnerable group.
"Green Light": Out of danger.
"Dark Green": Top 5% in the world.

Source: "Governance Matters" by Daniel Kaufmann, Aart Kraay and Pablo Zoido-Lobaton, May 1999.
http://www.worldbank.org/wbi/governance/gov_data.htm

Illustrative Governance: 4. Regulatory Framework

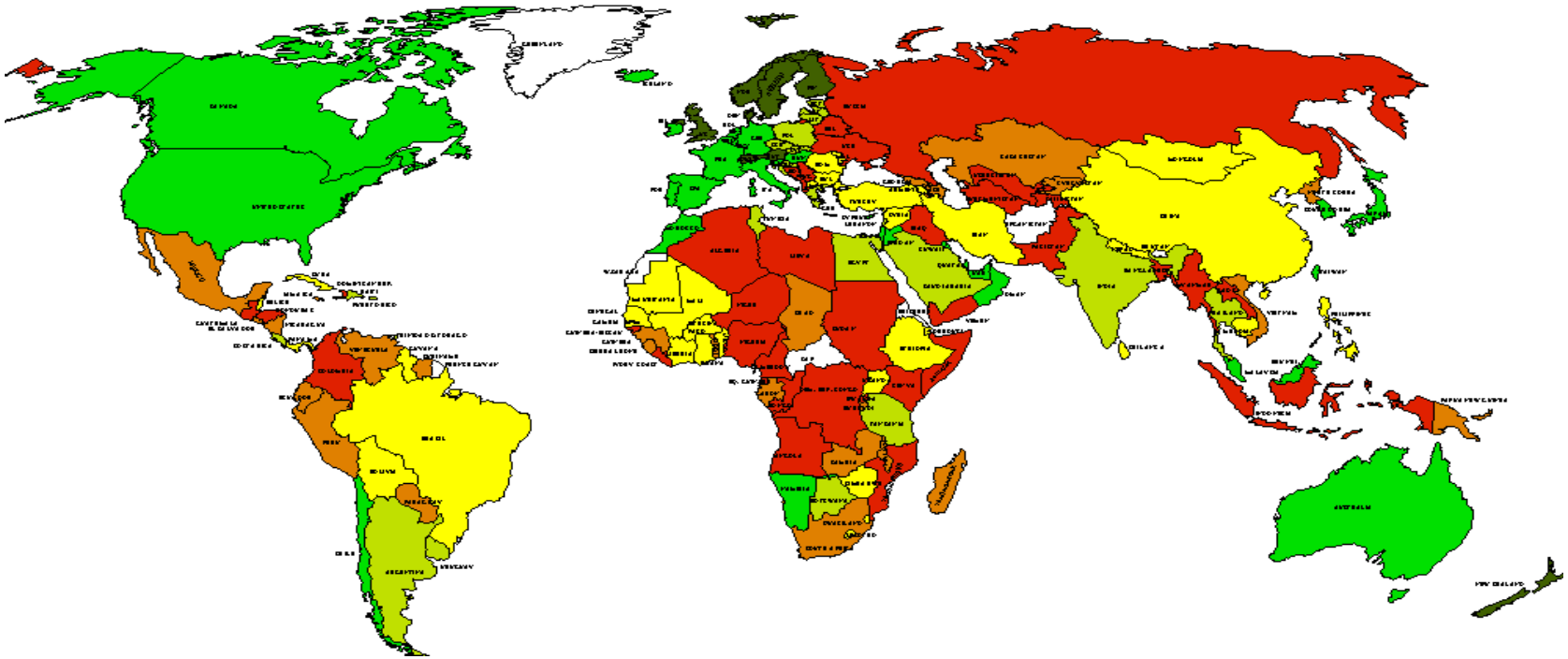


Regulatory Framework Performance:

Indicator not available.
"Red Light": Bottom group.
Next-to-bottom group.
"Yellow Light": Vulnerable group.
Less vulnerable group.
"Green Light": Out of danger.

Source: "Governance Matters" by Daniel Kaufmann, Aart Kraay and Pablo Zoido-Lobaton, May 1999.
http://www.worldbank.org/wbi/governance/gov_data.htm

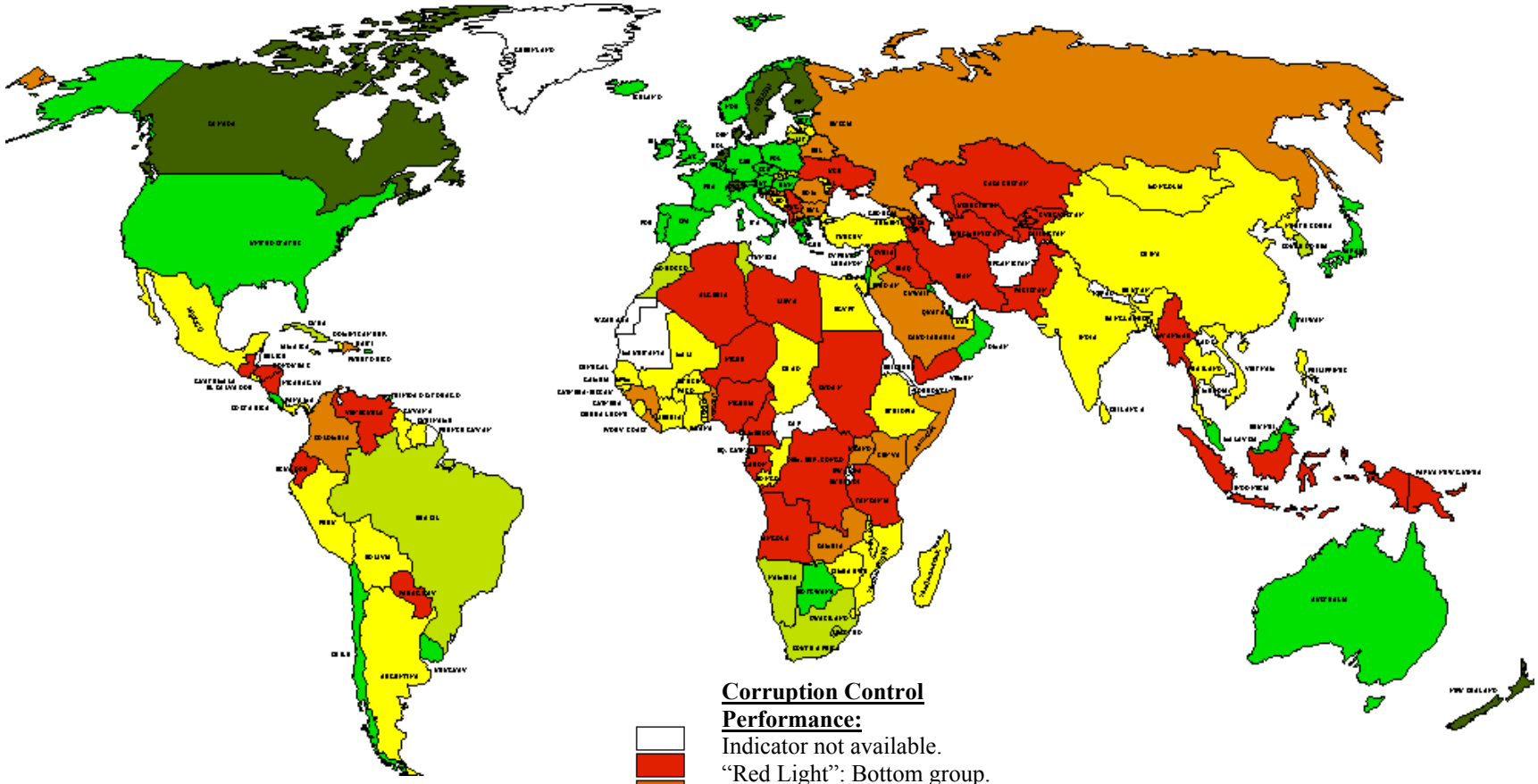
Illustrative Governance: 5. Rule of Law



Rule of Law Performance:
Indicator not available.
"Red Light": Bottom group.
Next-to-bottom group.
"Yellow Light": Vulnerable group.
Less vulnerable group.
"Green Light": Out of danger.

Source: "Governance Matters" by Daniel Kaufmann, Aart Kraay and Pablo Zoido-Lobaton, May 1999.
http://www.worldbank.org/wbi/governance/gov_data.htm

Illustrative Governance: 6. Corruption Control



Corruption Control Performance:
Indicator not available.
"Red Light": Bottom group.
Next-to-bottom group.
"Yellow Light": Vulnerable group.
Less vulnerable group.
"Green Light": Out of danger.

Source: "Governance Matters" by Daniel Kaufmann, Aart Kraay and Pablo Zoido-Lobaton, May 1999.
http://www.worldbank.org/wbi/governance/gov_data.htm

Appendix 4. Quantitative Studies of Data Sets on Democracy

Name of Index	Attributes & Components	Measurement Level	Aggregation Rule
ACLP: Alvarez, Cheibub, Limongi, &Przeworski (1996)	Contestation	Nominal	Multiplicative at the level of attributes and components
	Offices - election executive - election legislature	Nominal	
Arat (1991)	Participation - executive selection - legislative selection - legislative effectiveness - competitiveness of the nomination process	Ordinal	Additive at the level of components; combined additive and multiplicative at the level of attributes
	Inclusiveness	Ordinal	
	Competitiveness - party legitimacy - party competitiveness	Ordinal	
	Coerciveness	Interval	
Bollen (1980; 1993)	Political Liberties - press freedom - freedom of group opposition - government sanctions	Interval	Factor scores (weighted averages)
	Democratic Rule - fairness of elections - executive selection - legislative selection and effectiveness	Interval	
Coppedge & Reinicke: Polyarchy (1991)	Contestation - free and fair elections - freedom of organization - freedom of expression - pluralism in the media	Ordinal	Guttman scale (hierarchical) at the level of components
Freedom House (2000)	Political Rights (9 components)	Ordinal	Additive at the level of components
	Civil Rights (13 components)	Ordinal	
Gasiorowski: Political Regime Change (1996)	Competitiveness	Ordinal with residual category	None
	Inclusiveness		
	Civil and Political Liberties		
Hadenius (1992)	Election -suffrage - elected offices - meaningful elections	Interval and ordinal	Combined additive and multiplicative (of weighted scores) at the level of attributes
	Political Freedom - freedom of organization - freedom of expression - freedom of coercion	Ordinal	
Marshall and Jaggers: Polity IV (2001)	Competitiveness of Participation	Ordinal	Additive (of weighted scores)
	Regulation of Participation	Ordinal	
	Competitiveness of Executive Recruitment	Ordinal	
	Openness of Executive Recruitment	Ordinal	
	Constraints on Executive	Ordinal	
Vanhanen (2000)	Competition	Interval	Multiplicative
	Participation	Interval	

Appendix 5. Components of Freedom House Democracy Index

Components of Political Rights

- Is the head of state and/or head of government or other chief authority elected through free and fair elections?
- Are the legislative representatives elected through free and fair elections?
- Are there fair electoral laws, equal campaigning opportunities, fair polling, and honest tabulation of ballots?
- Are the voters able to endow their freely elected representatives with real power?
- Do the people have the right to organize in different political parties or other competitive political groupings of their choice, and is the system open to the rise and fall of these competing parties or groupings?
- Is there a significant opposition vote, de facto opposition power, and a realistic possibility for the opposition to increase its support or gain power through elections?
- Are the people free from domination by the military, foreign powers, totalitarian parties, religious hierarchies, economic oligarchies, or any other powerful group?
- Do cultural, ethnic, religious, and other minority groups have reasonable self-determination, self-government, autonomy, or participation through informal consensus in the decision-making process?

Components of Civil Liberties

Freedom of Expression and Belief

- Are there free and independent media and other forms of cultural expression? (Note: in cases where the media are state-controlled but offer pluralistic points of view, the Survey gives the system credit.)
- Are there free religious institutions and is there free private and public religious expression?

Association and Organizational Rights

- Is there freedom of assembly, demonstration, and open public discussion?
- Is there freedom of political or quasi-political organization? (Note: this includes political parties, civic organizations, ad hoc issue groups, etc.)
- Are there free trade unions and peasant organizations or equivalents, and is there effective collective bargaining? Are there free professional and other private organizations?

Rule of Law and Human Rights

- Is there an independent judiciary?
- Does the rule of law prevail in civil and criminal matters? Is the population treated equally under the law?
- Are police under direct civilian control?
- Is there protection from political terror, unjustified imprisonment, exile, or torture, whether by groups that support or oppose the system? Is there freedom from war and insurgencies? (Note: freedom from war and insurgencies enhances the liberties in a free society, but the absence of wars and insurgencies does not in and of itself make a not free society free.)
- Is there freedom from extreme government indifference and corruption?

Personal Autonomy and Economic Rights

- Is there open and free private discussion?
- Is there personal autonomy? Does the state control travel, choice of residence, or choice of employment? -
- Is there freedom from indoctrination and excessive dependency on the state?
- Are property rights secure? Do citizens have the right to establish private businesses? Is private business activity unduly influenced by government officials, the security forces, or organized crime?
- Are there personal social freedoms, including gender equality, choice of marriage partners, and size of family?
- Is there equality of opportunity, including freedom from exploitation by or dependency on landlords, employers, union leaders, bureaucrats, or other types of obstacles to a share of legitimate economic gains?

Appendix 6. Model Selections and Summarizations (JMP output)

The REG Procedure

Environmental Sustainability Model for All Sample Countries
Dependent Variable: ES

R-Square Selection Method

Number in Model	R-Square	Adjusted R-Square	C(p)	MSE	Variables in Model
1	0.5718	0.5679	5.1545	50.18355	QG
1	0.4448	0.4397	38.4390	65.07665	DEM
1	0.1288	0.1208	121.2031	102.10946	GEI
1	0.0364	0.0275	145.4250	112.94753	PG
1	0.0031	-.0061	154.1402	116.84715	EG
2	0.5891	0.5815	2.6399	48.60943	QG DEM
2	0.5825	0.5747	4.3736	49.39236	QG GEI
2	0.5741	0.5662	6.5594	50.37945	QG EG
2	0.5720	0.5641	7.1058	50.62619	QG PG
2	0.4624	0.4524	35.8242	63.59522	DEM GEI
3	0.5954	0.5840	2.9968	48.31475	QG DEM GEI
3	0.5946	0.5832	3.1973	48.40614	QG DEM EG
3	0.5891	0.5776	4.6394	49.06347	QG DEM PG
3	0.5836	0.5720	6.0660	49.71377	QG EG GEI
3	0.5825	0.5708	6.3503	49.84334	QG GEI PG
4	0.5991	0.5840	4.0158	48.31922	QG DEM EG GEI
4	0.5954	0.5801	4.9945	48.76949	QG DEM GEI PG
4	0.5947	0.5794	5.1647	48.84784	QG DEM EG PG
4	0.5839	0.5682	7.9961	50.15058	QG EG GEI PG
4	0.4843	0.4648	34.0891	62.15635	DEM EG GEI PG
5	0.5992	0.5801	6.0000	48.77204	QG DEM EG GEI PG

The REG Procedure

Environmental Sustainability Model for Asia
Dependent Variable: ES

R-Square Selection Method

Number in Model	R-Square	Adjusted R-Square	C(p)	MSE	Variables in Model
1	0.2633	0.2106	2.1406	34.60055	EG
1	0.1814	0.1229	3.7117	38.44493	DEM
1	0.1726	0.1134	3.8818	38.86116	QG
1	0.0843	0.0189	5.5763	43.00743	PG
1	0.0294	-.0399	6.6288	45.58270	GEI
2	0.4197	0.3305	1.1373	29.34811	QG EG
2	0.3750	0.2789	1.9958	31.61042	EG GEI
2	0.3383	0.2365	2.7006	33.46765	EG PG
2	0.2812	0.1706	3.7959	36.35391	QG DEM
2	0.2735	0.1617	3.9440	36.74423	DEM EG
3	0.4706	0.3382	2.1614	29.00788	EG GEI PG
3	0.4486	0.3108	2.5831	30.21183	QG EG PG
3	0.4221	0.2776	3.0922	31.66505	QG EG GEI
3	0.4204	0.2756	3.1239	31.75545	QG DEM EG
3	0.3821	0.2276	3.8601	33.85725	DEM EG GEI
4	0.4740	0.2828	4.0953	31.43921	DEM EG GEI PG
4	0.4734	0.2819	4.1069	31.47534	QG EG GEI PG
4	0.4583	0.2613	4.3982	32.38233	QG DEM EG PG
4	0.4222	0.2121	5.0896	34.53554	QG DEM EG GEI
4	0.2899	0.0316	7.6301	42.44726	QG DEM GEI PG
5	0.4790	0.2185	6.0000	34.25660	QG DEM EG GEI PG

The REG Procedure

Environmental Sustainability Model for Latin America and the Caribbean
Dependent Variable: ES

R-Square Selection Method

Number in Model	R-Square	Adjusted R-Square	C(p)	MSE	Variables in Model
1	0.5080	0.4806	0.4958	39.78477	QG
1	0.4153	0.3828	3.6016	47.27555	EG
1	0.2716	0.2311	8.4193	58.89489	DEM
1	0.1011	0.0512	14.1346	72.67929	PG
1	0.0057	-.0495	17.3322	80.39124	GEI
2	0.5711	0.5206	0.3789	36.71925	QG EG
2	0.5278	0.4723	1.8297	40.42414	QG GEI
2	0.5208	0.4644	2.0652	41.02560	QG PG
2	0.5094	0.4517	2.4463	41.99884	QG DEM
2	0.5013	0.4427	2.7173	42.69076	DEM EG
3	0.5783	0.4992	2.1375	38.35930	QG EG GEI
3	0.5712	0.4908	2.3763	39.00713	QG DEM EG
3	0.5711	0.4907	2.3788	39.01390	QG EG PG
3	0.5426	0.4568	3.3341	41.60582	QG GEI PG
3	0.5331	0.4455	3.6533	42.47214	DEM EG PG
4	0.5824	0.4710	4.0000	40.51861	QG DEM EG GEI
4	0.5785	0.4661	4.1305	40.89626	QG EG GEI PG
4	0.5712	0.4568	4.3756	41.60567	QG DEM EG PG
4	0.5473	0.4266	5.1764	43.92327	DEM EG GEI PG
4	0.5435	0.4217	5.3047	44.29468	QG DEM GEI PG
5	0.5824	0.4333	6.0000	43.41273	QG DEM EG GEI PG

The REG Procedure

Environmental Sustainability Model for the Middle East and North Africa
Dependent Variable: ES

R-Square Selection Method

Number in Model	R-Square	Adjusted R-Square	C(p)	MSE	Variables in Model
1	0.3921	0.3161	13.4660	16.90521	DEM
1	0.1627	0.0580	20.8111	23.28410	PG
1	0.1566	0.0512	21.0064	23.45371	EG
1	0.1498	0.0435	21.2255	23.64398	QG
1	0.0782	-.0370	23.5157	25.63293	GEI
2	0.6583	0.5607	6.9419	10.86000	DEM PG
2	0.5306	0.3964	11.0318	14.91929	DEM EG
2	0.5142	0.3754	11.5549	15.43846	QG GEI
2	0.4718	0.3209	12.9139	16.78728	DEM GEI
2	0.4208	0.2553	14.5476	18.40874	QG DEM
3	0.8726	0.8089	2.0802	4.72465	DEM EG PG
3	0.6838	0.5257	8.1252	11.72426	QG DEM PG
3	0.6589	0.4883	8.9229	12.64793	DEM GEI PG
3	0.6545	0.4817	9.0644	12.81181	QG DEM GEI
3	0.6349	0.4524	9.6893	13.53539	DEM EG GEI
4	0.8751	0.7751	4.0006	5.55893	QG DEM EG PG
4	0.8739	0.7730	4.0381	5.61097	DEM EG GEI PG
4	0.7227	0.5009	8.8795	12.33829	QG DEM GEI PG
4	0.7080	0.4744	9.3508	12.99306	QG DEM EG GEI
4	0.5607	0.2093	14.0668	19.54606	QG EG GEI PG
5	0.8751	0.7189	6.0000	6.94760	QG DEM EG GEI PG

The REG Procedure

Environmental Sustainability Model for Sub-Saharan Africa
Dependent Variable: ES

R-Square Selection Method

Number in Model	R-Square	Adjusted R-Square	C(p)	MSE	Variables in Model
1	0.2997	0.2646	-0.6510	32.67103	QG
1	0.1957	0.1555	1.9245	37.52105	GEI
1	0.1222	0.0783	3.7450	40.94937	DEM
1	0.0927	0.0473	4.4756	42.32522	EG
1	0.0445	-.0033	5.6707	44.57593	PG
2	0.3176	0.2458	0.9045	33.50954	QG GEI
2	0.3068	0.2339	1.1711	34.03785	QG PG
2	0.3005	0.2268	1.3289	34.35072	QG DEM
2	0.3003	0.2266	1.3343	34.36136	QG EG
2	0.2590	0.1810	2.3566	36.38801	GEI PG
3	0.3350	0.2242	2.4730	34.46829	QG GEI PG
3	0.3331	0.2219	2.5211	34.56893	EG GEI PG
3	0.3214	0.2083	2.8110	35.17548	QG EG GEI
3	0.3181	0.2045	2.8919	35.34479	QG DEM GEI
3	0.3094	0.1944	3.1067	35.79408	QG EG PG
4	0.3506	0.1978	4.0877	35.64216	QG EG GEI PG
4	0.3457	0.1918	4.2081	35.90882	DEM EG GEI PG
4	0.3382	0.1824	4.3953	36.32369	QG DEM GEI PG
4	0.3217	0.1621	4.8028	37.22644	QG DEM EG GEI
4	0.3121	0.1502	5.0416	37.75544	QG DEM EG PG
5	0.3541	0.1523	6.0000	37.66332	QG DEM EG GEI PG

The REG Procedure

Environmental Sustainability Model for East and Central Europe
Dependent Variable: ES

R-Square Selection Method

Number in Model	R-Square	Adjusted R-Square	C(p)	MSE	Variables in Model
1	0.5920	0.5693	0.9889	25.22739	GEI
1	0.4561	0.4259	6.6459	33.62764	QG
1	0.3486	0.3124	11.1261	40.28045	DEM
1	0.1860	0.1408	17.8932	50.32911	EG
1	0.0916	0.0411	21.8268	56.17021	PG
2	0.6157	0.5705	2.0030	25.16125	DEM GEI
2	0.6150	0.5697	2.0315	25.20604	EG GEI
2	0.5993	0.5522	2.6837	26.23147	QG GEI
2	0.5932	0.5453	2.9392	26.63322	GEI PG
2	0.4731	0.4111	7.9408	34.49711	QG EG
3	0.6396	0.5720	3.0071	25.07004	DEM EG GEI
3	0.6231	0.5524	3.6945	26.21851	DEM GEI PG
3	0.6187	0.5472	3.8782	26.52531	QG DEM GEI
3	0.6168	0.5449	3.9571	26.65718	QG EG GEI
3	0.6151	0.5429	4.0270	26.77390	EG GEI PG
4	0.6629	0.5730	4.0354	25.00989	QG DEM EG GEI
4	0.6434	0.5483	4.8479	26.45777	DEM EG GEI PG
4	0.6252	0.5252	5.6067	27.80991	QG DEM GEI PG
4	0.6176	0.5156	5.9242	28.37556	QG EG GEI PG
4	0.4804	0.3419	11.6344	38.55079	QG DEM EG PG
5	0.6638	0.5437	6.0000	26.72880	QG DEM EG GEI PG

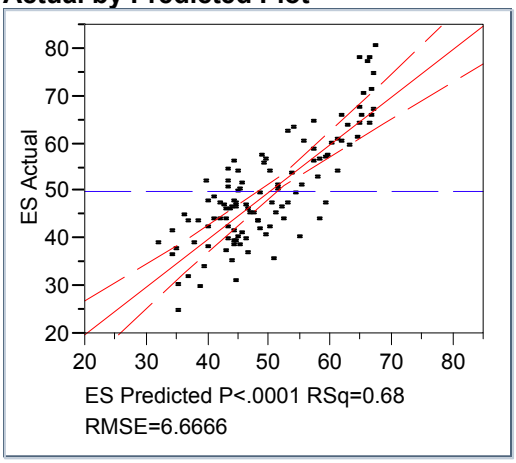
The REG Procedure

Environmental Sustainability Model for the OECD
Dependent Variable: ES

R-Square Selection Method

Number in Model	R-Square	Adjusted R-Square	C(p)	MSE	Variables in Model
1	0.6625	0.6500	2.9185	44.34807	QG
1	0.4315	0.4104	22.0341	74.71293	DEM
1	0.1099	0.0769	48.6434	116.98140	GEI
1	0.0082	-.0286	57.0549	130.34310	PG
1	0.0078	-.0289	57.0865	130.39322	EG
2	0.6810	0.6565	3.3917	43.53533	QG EG
2	0.6741	0.6491	3.9600	44.47277	QG GEI
2	0.6741	0.6490	3.9650	44.48099	QG PG
2	0.6695	0.6441	4.3442	45.10652	QG DEM
2	0.5467	0.5118	14.5053	61.86802	DEM PG
3	0.7186	0.6848	2.2822	39.94205	QG EG PG
3	0.6939	0.6572	4.3211	43.43989	QG DEM EG
3	0.6886	0.6512	4.7652	44.20179	QG EG GEI
3	0.6844	0.6465	5.1091	44.79191	QG GEI PG
3	0.6824	0.6443	5.2777	45.08116	QG DEM GEI
4	0.7220	0.6757	4.0002	41.10241	QG EG GEI PG
4	0.7187	0.6718	4.2711	41.58657	QG DEM EG PG
4	0.7023	0.6526	5.6332	44.02065	QG DEM EG GEI
4	0.6855	0.6331	7.0203	46.49957	QG DEM GEI PG
4	0.6121	0.5474	13.0932	57.35198	DEM EG GEI PG
5	0.7220	0.6616	6.0000	42.88911	QG DEM EG GEI PG

Response ES for All Sample Countries
Actual by Predicted Plot



Summary of Fit

RSquare	0.675858
RSquare Adj	0.660274
Root Mean Square Error	6.66663
Mean of Response	50.04727
Observations (or Sum Wgts)	110

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	5	9637.523	1927.50	43.3693
Error	104	4622.171	44.44	Prob > F
C. Total	109	14259.694		<.0001

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	21.283503	3.584545	5.94	<.0001
QG	9.7962916	1.707749	5.74	<.0001
DEM	0.6362836	0.296113	2.15	0.0340
EG	-0.071272	0.209856	-0.34	0.7348
GEI	-0.030576	0.024753	-1.24	0.2195
PG	-1.173449	0.67789	-1.73	0.0864

Effect Tests

Source	Nparm	DF	Sum of Squares	F Ratio	Prob > F
QG	1	1	1462.4742	32.9060	<.0001
DEM	1	1	205.2097	4.6173	0.0340
EG	1	1	5.1263	0.1153	0.7348
GEI	1	1	67.8131	1.5258	0.2195
PG	1	1	133.1748	2.9965	0.0864

Scaled Estimates

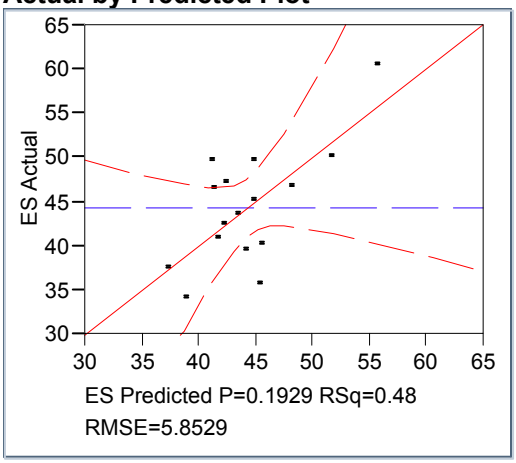
Continuous factors centered by mean, scaled by range/2

Term	Scaled Estimate	Plot Estimate	Std Error	t Ratio	Prob>|t|
Intercept	50.047273	++++++++++++++++++++++++++++++	0.635638	78.74	<.0001
QG	14.92819	++++++++++++++++++++++++++++++	2.602372	5.74	<.0001
DEM	3.8177018	++++++++	1.776681	2.15	0.0340
EG	-0.848133	--	2.497284	-0.34	0.7348
GEI	-4.054351	--------	3.282244	-1.24	0.2195
PG	-3.813709	--------	2.203144	-1.73	0.0864

Durbin-Watson

Durbin-Watson	Number of Obs.	AutoCorrelation
1.491166	110	0.0972

Response ES for Asia
Actual by Predicted Plot



Summary of Fit

RSquare	0.478995
RSquare Adj	0.218493
Root Mean Square Error	5.852913
Mean of Response	44.425
Observations (or Sum Wgts)	16

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	5	314.94404	62.9888	1.8387
Error	10	342.56596	34.2566	Prob > F
C. Total	15	657.51000		0.1929

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	55.75424	17.77453	3.14	0.0106
QG	1.5387835	4.984044	0.31	0.7639
DEM	-0.233076	0.712796	-0.33	0.7504
EG	-1.618921	0.849705	-1.91	0.0859
GEI	0.0284606	0.045104	0.63	0.5422
PG	-2.739136	2.624134	-1.04	0.3211

Effect Tests

Source	Nparm	DF	Sum of Squares	F Ratio	Prob > F
QG	1	1	3.26539	0.0953	0.7639
DEM	1	1	3.66275	0.1069	0.7504
EG	1	1	124.35393	3.6301	0.0859
GEI	1	1	13.63971	0.3982	0.5422
PG	1	1	37.32496	1.0896	0.3211

Scaled Estimates

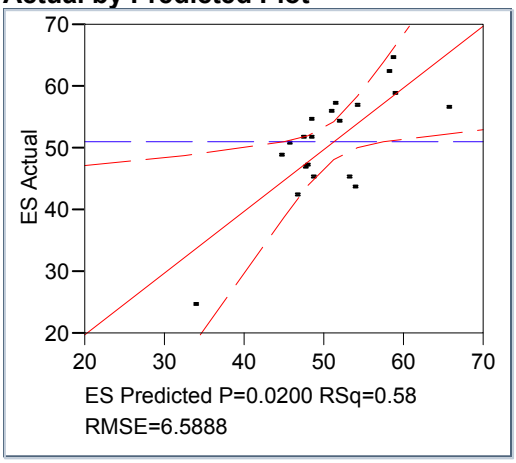
Continuous factors centered by mean, scaled by range/2

Term	Scaled Estimate	Plot Estimate	Std Error	t Ratio	Prob>|t|
Intercept	44.425	++++++++++++++++++++++++++++++++	1.463228	30.36	<.0001
QG	1.6948796	++++++	5.489631	0.31	0.7639
DEM	-1.281916	----	3.920378	-0.33	0.7504
EG	-8.904066	----------	4.673376	-1.91	0.0859
GEI	3.7738721	++++++++++++++++	5.980764	0.63	0.5422
PG	-3.42392	----------	3.280168	-1.04	0.3211

Durbin-Watson

Durbin-Watson	Number of Obs.	AutoCorrelation
2.1300051	16	-0.1659

Response ES for Latin America and the Caribbean
Actual by Predicted Plot



Summary of Fit

RSquare	0.5824
RSquare Adj	0.433257
Root Mean Square Error	6.588834
Mean of Response	51.04
Observations (or Sum Wgts)	20

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	5	847.6298	169.526	3.9050
Error	14	607.7782	43.413	Prob > F
C. Total	19	1455.4080		0.0200

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	21.975496	16.82731	1.31	0.2126
QG	8.5993827	7.92847	1.08	0.2964
DEM	0.5127542	1.419368	0.36	0.7233
EG	1.2973315	1.13577	1.14	0.2725
GEI	-0.058445	0.095362	-0.61	0.5498
PG	0.0151095	3.241574	0.00	0.9963

Effect Tests

Source	Nparm	DF	Sum of Squares	F Ratio	Prob > F
QG	1	1	51.070832	1.1764	0.2964
DEM	1	1	5.665596	0.1305	0.7233
EG	1	1	56.641949	1.3047	0.2725
GEI	1	1	16.306791	0.3756	0.5498
PG	1	1	0.000943	0.0000	0.9963

Scaled Estimates

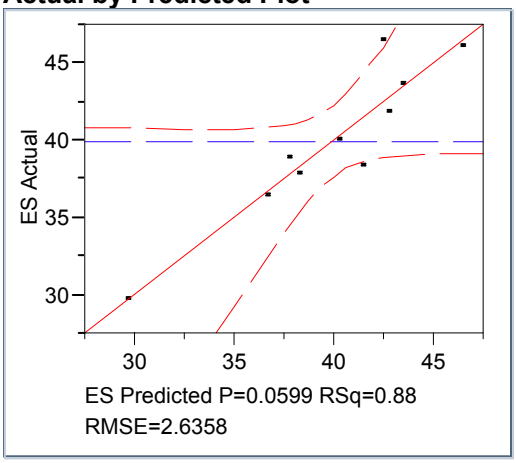
Continuous factors centered by mean, scaled by range/2

Term	Scaled Estimate	Plot Estimate	Std Error	t Ratio	Prob>|t|
Intercept	51.04	++++++++++++++++++++++++++++++++	1.473308	34.64	<.0001
QG	8.6405888	++++++++++++++++++++++++++++++++	7.966461	1.08	0.2964
DEM	1.7946398	++++++	4.967788	0.36	0.7233
EG	6.2271914	++++++++++++++++++++++++++	5.451696	1.14	0.2725
GEI	-2.562825	----------	4.181608	-0.61	0.5498
PG	0.0188868		4.051968	0.00	0.9963

Durbin-Watson

Durbin-Watson	Number of Obs.	AutoCorrelation
1.895646	20	-0.0650

Response ES for the Middle East and North Africa
Actual by Predicted Plot



Summary of Fit

RSquare	0.875082
RSquare Adj	0.718935
Root Mean Square Error	2.635829
Mean of Response	39.99
Observations (or Sum Wgts)	10

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	5	194.67862	38.9357	5.6042
Error	4	27.79038	6.9476	Prob > F
C. Total	9	222.46900		0.0599

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	36.683156	4.722507	7.77	0.0015
QG	-0.58221	2.984132	-0.20	0.8548
DEM	1.4582293	0.4596	3.17	0.0338
EG	1.5385103	0.696484	2.21	0.0917
GEI	0.0043022	0.173875	0.02	0.9814
PG	-2.848764	1.231541	-2.31	0.0817

Effect Tests

Source	Nparm	DF	Sum of Squares	F Ratio	Prob > F
QG	1	1	0.264459	0.0381	0.8548
DEM	1	1	69.939932	10.0668	0.0338
EG	1	1	33.901075	4.8795	0.0917
GEI	1	1	0.004253	0.0006	0.9814
PG	1	1	37.174913	5.3508	0.0817

Scaled Estimates

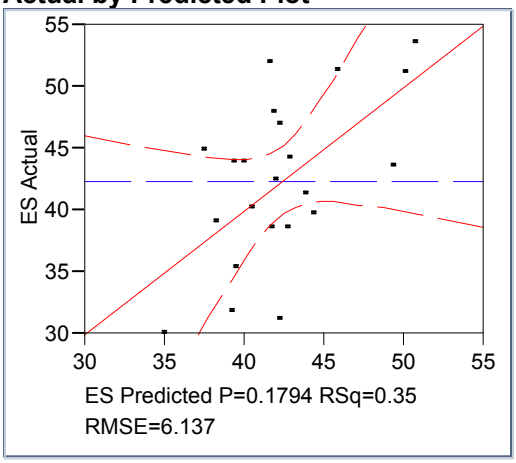
Continuous factors centered by mean, scaled by range/2

Term	Scaled Estimate	Plot Estimate	Std Error	t Ratio	Prob>|t|
Intercept	39.99	++++++++++++++++++++++++++++++++	0.833522	47.98	<.0001
QG	-0.483263	--	2.476974	-0.20	0.8548
DEM	5.8329174	++++++++++++++++++++++++++++++++	1.838402	3.17	0.0338
EG	3.6154992	++++++++++++++++++++++++	1.636737	2.21	0.0917
GEI	0.055283		2.234289	0.02	0.9814
PG	-4.700461	----------	2.032042	-2.31	0.0817

Durbin-Watson

Durbin-Watson	Number of Obs.	AutoCorrelation
2.4378848	10	-0.2470

Response ES for Sub-Saharan Africa
Actual by Predicted Plot



Summary of Fit

RSquare	0.354116
RSquare Adj	0.152278
Root Mean Square Error	6.137045
Mean of Response	42.38636
Observations (or Sum Wgts)	22

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	5	330.39277	66.0786	1.7545
Error	16	602.61313	37.6633	Prob > F
C. Total	21	933.00591		0.1794

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	40.907035	17.94026	2.28	0.0366
QG	2.769578	6.071586	0.46	0.6544
DEM	0.178757	0.603579	0.30	0.7709
EG	0.5102073	0.811456	0.63	0.5384
GEI	0.1844936	0.180773	1.02	0.3226
PG	-3.68538	4.113172	-0.90	0.3835

Effect Tests

Source	Nparm	DF	Sum of Squares	F Ratio	Prob > F
QG	1	1	7.836850	0.2081	0.6544
DEM	1	1	3.303517	0.0877	0.7709
EG	1	1	14.889558	0.3953	0.5384
GEI	1	1	39.229428	1.0416	0.3226
PG	1	1	30.236352	0.8028	0.3835

Scaled Estimates

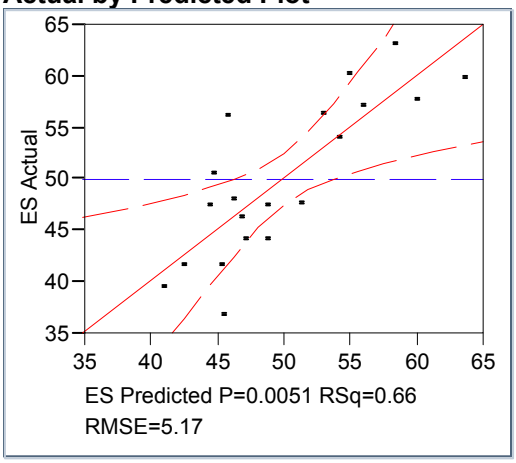
Continuous factors centered by mean, scaled by range/2

Term	Scaled Estimate	Plot Estimate	Std Error	t Ratio	Prob>|t|
Intercept	42.386364	++++++++++++++++++++++++++++++++	1.308422	32.40	<.0001
QG	2.351788	++++++++++++	5.155689	0.46	0.6544
DEM	0.8937849	++++	3.017894	0.30	0.7709
EG	2.7040985	+++++++++++++	4.300717	0.63	0.5384
GEI	3.4869293	++++++++++++++++++++	3.416618	1.02	0.3226
PG	-2.764035	----------	3.084879	-0.90	0.3835

Durbin-Watson

Durbin-Watson	Number of Obs.	AutoCorrelation
1.9471298	22	-0.2428

Response ES for East and Central Europe
Actual by Predicted Plot



Summary of Fit

RSquare	0.663782
RSquare Adj	0.543704
Root Mean Square Error	5.16999
Mean of Response	50.01
Observations (or Sum Wgts)	20

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	5	738.7748	147.755	5.5279
Error	14	374.2032	26.729	Prob > F
C. Total	19	1112.9780		0.0051

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	45.888563	9.561125	4.80	0.0003
QG	-6.280966	6.821099	-0.92	0.3727
DEM	1.0952121	0.789548	1.39	0.1871
EG	0.3944698	0.311204	1.27	0.2256
GEI	0.3578552	0.129515	2.76	0.0152
PG	0.3089256	1.642835	0.19	0.8535

Effect Tests

Source	Nparm	DF	Sum of Squares	F Ratio	Prob > F
QG	1	1	22.66332	0.8479	0.3727
DEM	1	1	51.43027	1.9242	0.1871
EG	1	1	42.94542	1.6067	0.2256
GEI	1	1	204.05864	7.6344	0.0152
PG	1	1	0.94515	0.0354	0.8535

Scaled Estimates

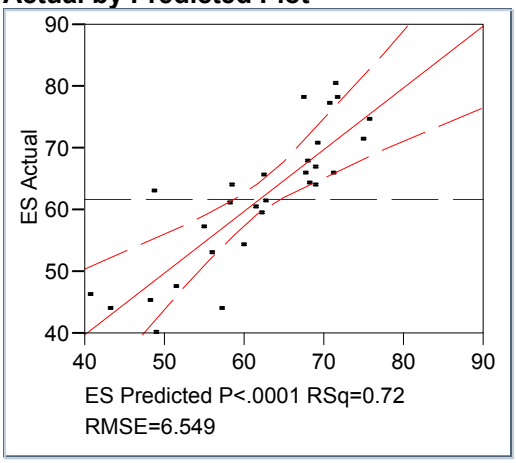
Continuous factors centered by mean, scaled by range/2

Term	Scaled Estimate	Plot Estimate	Std Error	t Ratio	Prob>|t|
Intercept	50.01	++++++++++++++++++++++++++++++++	1.156045	43.26	<.0001
QG	-5.924142	----------	6.43359	-0.92	0.3727
DEM	5.4760607	++++++++++++++++++	3.947741	1.39	0.1871
EG	3.3924404	++++++++++++	2.676354	1.27	0.2256
GEI	10.019945	++++++++++++++++++++++++++++++++	3.626416	2.76	0.0152
PG	0.5560662		2.957102	0.19	0.8535

Durbin-Watson

Durbin-Watson	Number of Obs.	AutoCorrelation
1.5981536	20	0.1208

Response ES for the OECD
Actual by Predicted Plot



Summary of Fit

RSquare	0.721993
RSquare Adj	0.661557
Root Mean Square Error	6.548978
Mean of Response	61.84483
Observations (or Sum Wgts)	29

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	5	2561.8422	512.368	11.9464
Error	23	986.4495	42.889	Prob > F
C. Total	28	3548.2917		<.0001

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	2.7981868	13.06378	0.21	0.8323
QG	17.237784	5.716415	3.02	0.0062
DEM	0.0287107	2.066364	0.01	0.9890
EG	-1.468245	0.844831	-1.74	0.0956
GEI	-0.025182	0.048362	-0.52	0.6076
PG	3.9865364	3.119444	1.28	0.2140

Effect Tests

Source	Nparm	DF	Sum of Squares	F Ratio	Prob > F
QG	1	1	389.99808	9.0932	0.0062
DEM	1	1	0.00828	0.0002	0.9890
EG	1	1	129.54007	3.0203	0.0956
GEI	1	1	11.62806	0.2711	0.6076
PG	1	1	70.04614	1.6332	0.2140

Scaled Estimates

Continuous factors centered by mean, scaled by range/2

Term	Scaled Estimate	Plot Estimate	Std Error	t Ratio	Prob>|t|
Intercept	61.844828	++++++++++++++++++++++++++++++++	1.216115	50.85	<.0001
QG	17.662326	++++++++++++++++++++++++++++++++	5.857202	3.02	0.0062
DEM	0.1004875		7.232272	0.01	0.9890
EG	-6.166628	----------	3.548291	-1.74	0.0956
GEI	-1.497047	--	2.875115	-0.52	0.6076
PG	4.9831705	++++++++++	3.899305	1.28	0.2140

Durbin-Watson

Durbin-Watson	Number of Obs.	AutoCorrelation
2.3391198	29	-0.1906

Vita

Han Gyu Lheem was born and grown up in South Korea. After completing his Bachelor of Art degree in Public Administration, he had traveled and worked in Japan, France and Germany as a journalist. He came to the United States to pursue his graduate education in 1997. He attended the University of Tennessee, Knoxville and received his Master of Art degree in 1999 and Doctor of Philosophy degree in Political Science in 2003. He has been also working for a nonprofit organization, World Citizenship Institute since 2000.