

Environment and Security in an International Context

Executive Summary Report

NATO/Committee on The Challenges of Modern Society Pilot Study
Pilot Study Co-Chairs
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Abstract: NATO, its Member States, and other security organizations are increasingly concerned with non-traditional threats to security, including the consequences of environmental change. This report addresses the relationship between environmental change and security at the regional, international and global levels. To support the development of these conclusions and recommendations, the Committee on the Challenges of Modern Society Pilot Study developed methodologies and approaches for analyzing the relationship of environmental change and security and prioritizing its key elements. The interdisciplinary nature of the Pilot Study has provided a multilateral forum for cooperation, exchange and dialogue among the environmental, development, foreign and security policy communities.

PREFACE

In 1969, the North Atlantic Treaty Organization (NATO) established the Committee on the Challenges of Modern Society (CCMS) as a unique forum for cooperation on issues of inter alia transboundary environmental protection and environmental problems in general. Through the CCMS framework, Member States conduct pilot studies and projects on a wide range of topics such as transboundary air and water pollution, marine oil pollution, and environmental problems stemming from the use of modern technology.

NATO, its Member States, and other security organizations are increasingly concerned with non-traditional threats to security, including the consequences of environmental change. The Pilot Study entitled "Environment and Security in an International Context" was launched within the framework of NATO/CCMS on the occasion of the NATO/CCMS Plenary Meeting in Washington, DC on 14 November 1995. This report summarizes the relationship between environmental change and security at the regional, international, and global levels.

The Pilot Study is co-chaired by Germany and the United States. Its main goal is to elaborate conclusions and recommendations to integrate environmental considerations in security deliberations and to integrate security considerations in national and international environmental policies and instruments. These conclusions and recommendations are guided by the principles of sustainable development and a precautionary approach, emphasizing preventive measures and strategies. They will ultimately provide a basis for senior-level decision-making. To support the development of these conclusions and recommendations, the Pilot Study developed methodologies and approaches for analyzing the relationship of environmental change and security and prioritizing its key elements.

The Pilot Study has evolved as a truly unique opportunity for the exchange of information and views from a wide range of experts in the scientific and policy communities. The interdisciplinary nature of the Pilot Study has provided a multilateral forum for co-operation, exchange, and dialogue among the environmental, development, foreign, and security policy communities. The completion of the Pilot Study through a consensus-based process offers the opportunity to continue and expand the spirit of

non-governmental organizations (NGO) from the member countries of the NATO Alliance and Euro-Atlantic Partnership Council (EAPC). In addition, experts from other international and regional organizations played a valuable role in providing input on the conclusions and recommendations developed in the Pilot Study. Most importantly, we would like to acknowledge and thank all those who participated in the Pilot Study. We especially would like to commend and recognize all of those responsible parties who provided not only their expertise through actively engaging in research and the delivery of papers and presentations, but also those who contributed their organizational support and planning assistance in making the Pilot Study plenary meetings and subgroup work-
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lead to economic and social problems such as poverty, food insecurity, poor health conditions, and migration, within as well as between countries.⁶ Even so they seldom directly cause or trigger crisis and conflict. Political and economic stability and capacities, cultural and ethnic factors, or the existence of non-violent mechanisms of conflict resolution have a large impact on how environmental stress is dealt with by individuals and political stakeholders. If these contextual factors are unfavorable, the incidence of conflict due to the consequences of environmental stress is likely. If the contextual factors are favorable, the probability of a peaceful solution is improved.

As these environmental challenges continue, their impact on the potential incidence or escalation of tension and conflict are becoming a key concern for policymakers. However up to now—despite the recognition of the sustainability principle—the potentially unfavorable effects of unsustainable action, environmental degradation and resource scarcity have not gained the necessary recognition by political actors at the various levels.

For example, the consequences of global climate change

- Subgroup 2: "Definition and Development of a Database and a Decision Support System," looked at providing

areas of environmental, development, foreign, and security policy.

Importance of the Pilot Study

The Pilot Study's final product compiles existing state of the art research on the relationship between environmental change and security. At the same time, a large part of the Pilot Study's work is dedicated to developing parameters for response mechanisms directed towards political stakeholders from different policy sectors. The focus of these responses is on reducing the potential incidence or escalation of conflict, inter alia, enhancing security at the earliest possible stage. The structure of the pilot study reflects this orientation towards framing practical action. Another characteristic of this Pilot Study is that it deals with a broad social science issue discussing innovative policy responses for dealing with environmental stress and its potential effects on security.

Starting from Article 2 of the North Atlantic Treaty, which provides that parties will contribute towards the further development of peaceful and friendly international relations by promoting conditions of stability and well-being, this Pilot Study responds to the aim evolving from the 1991 Declaration on Peace and Co-operation, which defined its tasks to further evolve its partnership with countries in Central and Eastern Europe. Its results need to be interpreted under the umbrella of the Strategic Concept for the 21st Century which will be

adopted at the Washington DC NATO Summit in April 1999.

Today's broadened security challenges differ from the traditional ones in their expanded geographical reach. Therefore the results of the study are relevant for a larger audience, including other international organizations. As a result, this Pilot Study integrated other international organizations in its work with participation by representatives of the United Nations Development Programme and Environmental Programme, UN Economic Commission for Europe (UNECE), Organization for Security and Cooperation in Europe (OSCE), Organization for Economic Cooperation and Development (OECD) and the World Bank. This new approach follows the principle of integrating different policy sectors at the international level.

The Pilot Study also involved a wide range of experts from different fields and institutes. Policymakers, researchers, diplomats, and representatives of NGOs covering various policy areas, participated in the study by adding their respective expertise to address the topic of environment and security. The study benefited from the different insights drawn from the fields of environmental policy and research, conflict research and security studies, and development and foreign policy.

PILOT STUDY FINDINGS

Presented in this section are the Pilot Study's main findings

Key Findings: NATO Security Context

- * Although nations continue to be central actors in international politics, they increasingly participate in a multitude of international regimes and institutions. Nations are engaging in co-operation with international and regional organizations to respond to non-traditional security concerns including the environment.
- * The North Atlantic Treaty recognized from its beginning that security is not entirely a function of military power or geopolitical strength. It recognizes the need to include an economic, and to a lesser extent, a social dimension to its conception of security (see Art. 2 of the Treaty). This civil security dimension is given an institutional framework through the NATO Committee on the Challenges of Modern Society (CCMS).
- * Since the end of the Cold War, NATO looks increasingly at threats from non-traditional sources and addresses Alliance security in an expanded regional and global context. This new and broader security concept—the Strategic Concept of 1991—complements the emphasis on the defense dimension of security and recognizes that security and stability have political, economic, social and environmental elements.
- * The broad approach to security is reflected in three mutually reinforcing elements of Alliance security policy: dialogue, co-operation and collective defense. These elements should support NATO in remaining flexible and responsive to changing security conditions, so that its important role in the new security context can be guaranteed for the future.
- * The most serious impacts of environmental stress, due to transboundary effects, are likely to emerge in regions other than the Euro-Atlantic region, such as developing countries and countries in transition. Preventing the breakdown of global systems is a high policy priority for a number of states and the environment is understood as one of these global systems.
- * With reference to Article 4 of the North Atlantic Treaty, any issue can be brought before the Alliance for the purpose of consultation with other Member States when one Member State perceives the territorial integrity, political independence or security of any of the Member States is threatened. This could conceivably include an environmental issue.
- * As NATO provides the available fora for consultation and co-operation, to include EAPC and the PfP, environmental issues with security implications for Member States and Partner Countries can be addressed or resolved in the same fashion. This includes the development and co-ordination of data sharing and exchange arrangements for regional monitoring networks. Beyond data collection and monitoring, NATO will have to rely on co-operation with other respective organizations for preventive action.
- * The broad understanding of security increases the need for more co-operation among regional and international security institutions, such as WEU, OSCE, and UN as well as between security institutions and institutions in other policy areas such as environment, development and foreign and security policy.

- Consequences of environmental stress: poverty, food insecurity, poor health conditions, displacement, migration or refugee movements, and disruption of the social and political institutions are regarded as the most important consequences of environmental stress, which then contribute to conflict under a certain set of unfavorable contextual factors.

Environmental stress can also play different roles along the conflict dynamic. It can be a:

- Structural source of conflict: environmental stress is perceived as a permanent factor affecting the interests and preferences of the actors involved;
- Catalyst for conflict: environmental stress is further exacerbated by an existing unstable socio-economic situation and the resulting impacts are the increase in the potential incidence or escalation of conflict;
- Trigger for conflict: environmental stress instigates conflict when underlying causes for conflict are perceived as acute threats to a group's interests due to an unfavorable, sudden change in the environmental sphere.

Similar types of environmental stress may have different effects on security. Therefore the socio-economic and political context in which environmental stress occurs has to be taken into consideration when assessing the conflict potential of different types of environmental stress. Figure 2. 3 shows that contextual factors influence whether environmental change causes social, economic, and political and demographic consequences, which in turn impact on security. The contextual factors influence the process at a very early stage and vary accordingly to the different environmental stress conditions characterized within a country. Contextual factors have either a facilitating or inhibiting effect on the relationship between environmental stress and conflict. Relating back to our original hypothesis on the relationship between environmental change and security we have developed the

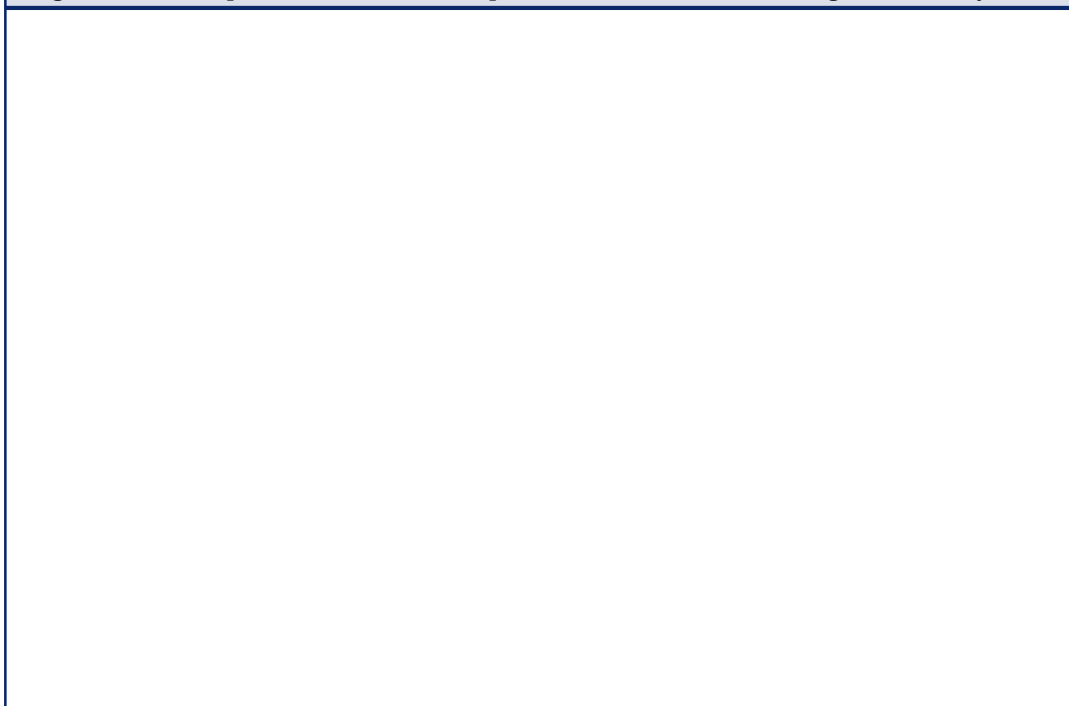
Key Findings: *Assessing the Links between Environment and Security*

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environmental stress can lead to conflict under unfavorable contextual factors, conflict can lead to more environmental stress;

- Consequences of environmental stress: poverty, food insecurity, poor health conditions, displacement, (migration or refugee movements), and disruption of the social and political institutions are regarded as the most important consequences from environmental stress, which then contribute to conflict under a certain set of unfavorable contextual factors.
- Environmental stress can play different roles along the conflict dynamic. It can be a: structural source as well as a catalyst for conflict or a trigger for conflict.
- Similar types of environmental stress may have different effects on the incidence of violence. Therefore the socio-economic and political context, in which environmental stress occurs, has to be taken into consideration while assessing the conflict potential of different environmental stress. These contextual factors identified comprise patterns of perception, economic vulnerability and resource dependency, institutional, socio-economic and technological capacity, cultural and ethno-political factors, violence-potential, and internal security structures, political stability, participation, international interaction, and mechanisms of conflict resolution.

Figure 2.3 - Conceptual Model: Relationship Between Environmental Change and Security



following conceptual model (see figure 2. 3).

The contextual factors identified are as follows:

- **Patterns of perception:** Whether or not environmental stress contributes to the potential incidence or escalation of conflict depends heavily upon the perceptions of the actors. For example, if environmental stress is perceived as directly impacting on an actor's interests and priorities, including threats to their physical or economic well-being, actors are more willing to escalate the conflict.
- **Economic vulnerability and resource dependency:** Economic vulnerability and resource dependency differ enormously among countries, but also among regions or social groups. The vulnerability caused by dependence on a degrading resource—such as fresh water—may enhance the probability of the incidence of conflict. Migration or flight are often the result of extreme dependence on a degrading resource, causing socio-economic and political stress in the receiving nation or state.
- **Institutional, socio-economic and technological capacity:** Institutional capacity of a government is a precondition for co-operative action on environmental stresses and their consequences. Socio-economic and technological capacities of a society and a government are further requirements for the reduction of environmental stress and the amelioration of its negative consequences.
- **Cultural and ethno-political factors:** The existence of ethnic,

typology [based primarily on the Environmental Conflicts Project (ENCOP)] can be understood as a research hypothesis, subject to further testing since the grouping of cases used were derived inductively.

According to the ENCOP categories and typology, it has been found that cases where environmental stress heightens the potential incidence of conflict were generally manifest in developing or transitional societies in socio-economic crisis. These conflicts can typically occur at the local or regional levels where commonly there is a marginalization or discrimination of one or more actors. Four general types of environmental conflict can be identified which fulfil the complexity requirements of a typology:

- Ethno-political conflicts are characterized by a coincidence of environmental and ethnic discrimination. Conflicts may emerge when two or more ethnic groups share one eco-region suffering from environmental stress and have limited access to the needed natural resources. Conflicts may also emerge when ethnic groups depend on neighboring eco-regions with highly distinct degrees of productivity. Violence may occur if and when the environmentally discriminated group invades another territory.
- Migration conflicts are either based on internal migration, cross-border migration or have a strong demographic component.
 - Internal migration conflicts are triggered by voluntary migration or forced displacement of inhabitants from one region to another within one country. The geographic origin of migrants or displaced persons is the primary criterion for conflicting social and political relationships between the actors. Migration is induced by structural changes such as persistent drought, flood, and soil erosion (desertification) or forced displacement and expulsion in connection with large unsustainable industrial projects, mineral extraction, dam projects and forestry.
 - Cross border migration conflicts are in general characterized by the same causes as internal migration conflict. When migrants or refugees cross national borders voluntarily, resettle in rural border areas or resettle in cities of a third country, they represent socially and at times a

source of political conflict potential.

- Demographically caused migration conflicts are characterized by high population pressure in eco-regions of low productivity leading to migration either to more favorable economic or to remote natural areas. They are likely to escalate when migrants compete with other groups for scarce resources.

- International resource conflicts are characterized by distribution problems. They are caused by an asymmetrical dependence on the quantity and quality of a resource, for example fresh water or fish stocks. The likelihood of violent escalation of international resource conflicts depends heavily on the specific constellation of contextual factors. Under favorable contextual factors, these conflicts may be resolved co-operatively.
- Consequences of global environmental change have not resulted in violent conflict thus far. However, the implementation of specific international environmental agreements has led to tensions between nations in a number of areas.

According to this typology of environmental conflicts, there are many cases that have been resolved without violence, demonstrating that there is a large potential for local, regional and international co-operation in the various policy areas.

Chapter 4: Integrated Risk Assessment

This section on integrated risk assessment establishes guidelines for assessing and prioritizing the potential impact of different types of environmental change on security. Here, we assess the risk of increasing the potential incidence or escalation of conflict. The assessment is termed integrated because of the broad range of factors that are considered (political, economic, social, demographic, and environmental factors). Chapter 2 established that environmental stress may generate a series of consequences (political, economic, social and demographic) and that those consequences impact on the potential incidence or escalation of conflict. This relationship might be further influenced by a series of structural or contextual factors.

The nature of the relationship between environmental stress and security is indirect and multi-causal. Environmental stress

Key Findings: *Integrated Risk Assessment*

- The nature of the relationship between environmental stress and security is indirect and multi-causal. Environmental stress can be prioritized according to time of impact, geographic area effected and magnitude of stress.
- The consequences of environmental stress (political, economic, social, and demographic) tend to be highly inter-related and the integrated risk assessment needs to address those relationships in assessing them.
- The complexity of the relationship between the consequences of environmental stress and the potential incidence or escalation of conflict is best controlled through the use of pattern matching; The Syndrome Approach of the German Government's Advisory Council on Global Change provides a set of experimental hypotheses as templates for pattern matching.
- The syndrome-based risk assessment is one approach that can help in identifying priorities for the development of early warning indicators and preventive action.
- Some preliminary research findings suggest that certain syndromes are more prone than others to the onset or escalation of conflict.
- Further development of the syndrome approach is also required to enable researchers, development practitioners and politicians alike, to more effectively concentrate on critical regions and critical interdependencies in the future.

can be prioritized according to time of impact, geographic area affected and magnitude of stress. The integrated risk assessment needs to control or manage the complexity in the relationship between the consequences of stress and contextual factors in order to determine which factors have the most potential impact on the incidence or escalation of conflict. The complexity of this relationship is best controlled through the use of pattern matching. The Syndrome Approach developed by the German Government's Advisory Council on Global Change (WBGU) and the Potsdam-Institute for Climate Impact Research (PIK), provides a set of experimental hypotheses as templates for pattern matching which help to control for complexity in the integrated risk assessment.

The Syndrome Approach provides a number of identifiable patterns of environmental stress. Identifying the potential set of consequences and their pattern of interaction in the context of a specific set of variables may allow for a broader set of potential responses for policymakers. The syndrome-based concept starts from the assumption that environmental stress is part of a dynamic human-nature interaction. The Syndrome Approach identifies different types of these interactions which occur in various environmental, administrative or geopolitical regions of the world. The overall importance of the syndrome-based approach for policymakers is that it may serve as a

First, it is recommended that tracking and monitoring a large number of environmental and contextual indicators are essential in order to assist analysts in forecasting the potential incidence of conflict and to determine the potential of existing conflicts escalating along the conflict continuum. The contextual indicators are critical in forecasting which environmental stresses are likely to produce conflictual outcomes.

Second, to be useful for early warning, indicator systems must provide an indication of critical problems and thresholds at very early stages, when it is still possible to avert future instability. It is preferable to focus on indicators that reveal levels of anticipated environmental stress. Warning indicators generally refer to anticipated environmental stress, contextual factors associated with environmental stress, and consequences of environmental stress.

Third, when sustainable development indicators are stressed beyond certain thresholds or reference values, they are likely to lead to unsustainability and be potential contributors to conflict. Reference values identify the thresholds at which changes over time in environmental indicators are transformed from being beneficial or neutral to being negative or risk-provoking along some dimension. These values are regionally or systematically specific and they may change over time. Reference values can be conceived in three ways: based entirely on scientific evidence, based on policy targets, usually scientific evidence in the context of national economic capability, technological capacity, or political will, and based in terms of public perception.

incidence or escalation of conflict. The multitude of socio-economic and political factors influencing environmental conflict and the different manifestations of conflict call for a co-operative and integrative approach towards the prevention of environmental conflict and its peaceful resolution. This

the aim of streamlining the body of existing rules. At the global level, relevant international bodies such as UNEP should be strengthened, enabling them to work effectively to solve environmental problems which pose potential security threats. In addition, exchange, integration and co-operation among the diverse institutions involved in the fields of environment and security should be enhanced which may involve establishing new for a and structures.

DEVELOPMENT POLICY KEY FINDINGS

- In order to establish preventive mechanisms for environmental conflicts, development policy, which is specifically directed at ameliorating selected consequences and contextual factors, plays an important role in respective regions. Development policy contributes to stabilizing the socio-economic and political context of actors experiencing environmental stress and can contribute to the prevention of environmental conflict. At the same time, it can be positively employed in post-conflict phases by supporting political, economic, and administrative reforms to change past structures which have contributed to conflict. Development co-operation can address both the consequences of environmental stress and the prevention of environmental stress at the different stages along the conflict continuum.
- To prevent deep-rooted societal conflicts, there are a number of possible sustainable development measures that should be implemented, ranging from sustainable economic growth and poverty reduction programs to strengthening equity, democratization and respect for human rights. The strengthening of local and sub-regional authorities and self-government bodies and the involvement of local participants in the development process are important prerequisites to enable the incorporation of the society into participatory structures. Democratic processes should be strengthened, allowing for the creation of a climate and the capacity for constructive interaction between civil society and government, a requirement for long-term sustainability.
- Multilateral and bilateral development co-operation is one approach to preventing conflict and ensuring sustainability. Development co-operation with the goal of sustainable human development needs to address specific population policies to offer solutions, for both environmental stress and rapid population growth. Economic decline or unequal economic growth may heighten tensions and contribute to the potential incidence or escalation of conflict. Therefore

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short-term stabilization programs and impartial adjudication.

- As far as security institutions are concerned, existing prevention and dialogue mechanisms can be used to address the security impact of environmental issues, capitalize on the catalytic function of environmental co-operation for confidence building, and enhance dialogue and co-operation among themselves. The existing mechanisms of mediation, dispute settlement, conciliation, and arbitration in the foreign and security field should be employed in environmental conflicts as appropriate. This includes the use of dispute settlement mechanisms of existing environmental regimes such as the International Court of Arbitration, and other principle international and regional security institutions such as UN and OSCE. Within NATO, the North Atlantic Council, the Euro-Atlantic Partnership Council, the Mediterranean Co-operation Group, the special relationship with the Russian Federation and the Ukraine all provide opportunities for consultation and preventive diplomacy.
- In the post-crisis management stage, a monitoring process which includes environmental, political, economic, social

State Failure Task Force Report: Phase II Findings

Prepared by Daniel C. Esty, Jack A. Goldstone,

Independent researchers to examine comprehensively the factors and forces that have

I. CONFIRMATION AND REFINEMENT OF THE GLOBAL MODEL

Updating the Problem Set and Revising the Control Cases

One problem frequently encountered in statistical analyses such as the one performed in the initial phase of the State Failure project is that specific results may be highly sensitive to a particular data set.² If the results reflect statistical accidents, rather than underlying social and political forces, then slight changes in the data set may greatly shift the results. Adding or subtracting cases, or changing the particular control cases, could make some variables newly significant or remove some variables from the list of significant factors. Our first task in re-examining our results was to update the problem set to include state failure cases from 1994-96, and to select new control sets for testing this new data, to make certain that our initial results proved robust.

It was reassuring to find that despite significant revisions and updating of the problem set and analyses using two different sets of control cases and three distinct analytical techniques, the *same* three variables—infant mortality, trade openness, and level of democracy—emerged as the critical discriminators between stable states and state failures. Moreover, these analyses resulted in about the same two-thirds range of accuracy in discriminating failures and stable cases.

State Failure Cases³

The set of “state failure cases” in the initial State Failure Task Force Report was updated and revised by reexamining all of the cases and consulting area experts to identify recent events (1994-96) for inclusion.⁴ A number of cases in the initial problem set were dropped as being of insufficient magnitude or not meeting the precise definitions for failure events. A considerable number of new cases from recent years were added. However, none of these changes affected the global model results.

Control Cases⁵

The two new sets of control cases were obtained, as before, by randomly selecting to match every country-year that preceded a state failure by two years, three countries that were stable (experienced no crises for the succeeding five years). Changing the control sets made no difference to any of the global model results.

The three analytical techniques used were logistic regression, neural network analysis, and genetic algorithm modeling.⁶ Logistic regression and neural network analysis were used to estimate the “predictive” accuracy of our models. Genetic algorithm modeling was used to help identify candidate sets of variables, as a check on the univariate regression methodology, and to validate the suggestions of Task Force social science and area experts. Although each method relies on different assumptions and methods of estimation, all techniques converged on identifying the same three-factor model as the most efficient discriminator between stable and failure cases and yielded models with accuracy of predicting case outcomes of about two-thirds.

Figure 1: Phase I Analytic Process

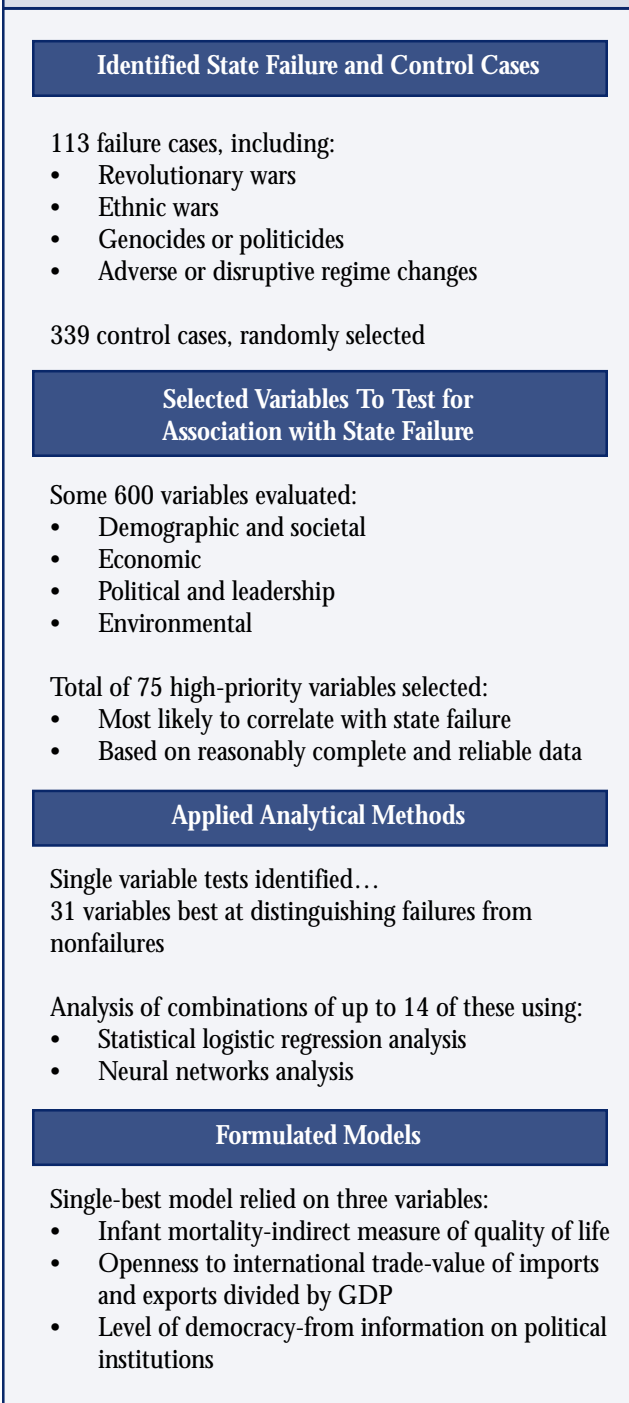


Table 1: Historical State Crises, by Type

Type of Crisis	Initial Phase	Phase II
Revolutionary war	41	50
Ethnic war	60	59
Regime transition	80	88
Genocide and politicide	46	36
Total Number of Consolidated Crises	113	127

Summary of Phase I Findings

The global model developed in the initial phase of the State Failure project and detailed in the task force report^a had the following features:

- It considered as “failures” four different kinds of political crisis—revolutionary wars, ethnic wars, adverse or disruptive regime transitions, and genocides or politicides—of varying magnitudes.*
- The model examined all such crises that occurred during the years 1957-94 in countries whose population in 1994 was greater than 500,000 according to US Census Bureau data.^b*
- The model compared conditions in countries that experienced crises at a time two years before the onset of a crisis with conditions in a matched set of stable—or “control”—countries that did not experience a crisis any time in the succeeding five years.*

The global model was developed after examining hundreds of candidate factors suggested as theoretically relevant to state crises and rigorously analyzing 75 variables that had been deemed highly relevant by experts and had global data available for most of the 1955-94 period. The Task Force found that the most efficient discrimin

polities guarantee civil rights to all citizens. Therefore, while the democracy index is based on an analysis of political institutions, it correlates very closely (+.90) with Freedom House indices of political rights and civil liberties.

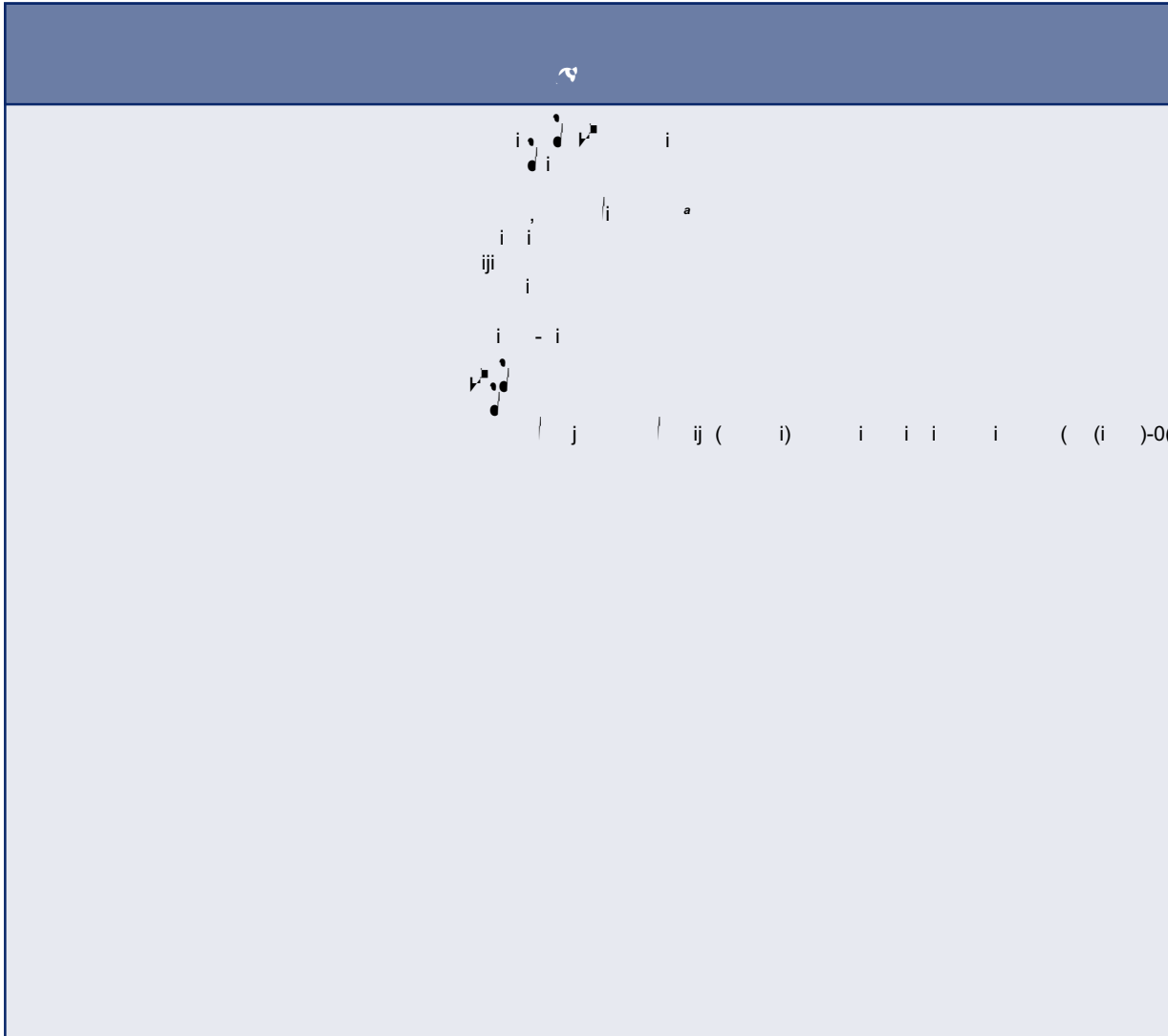
Results

Using the trichotomized measure of democracy, we discovered that *partial democracies are indeed far more vulnerable to state failure-type crises than are either full democracies or autocracies*. To be precise, when using this measure of democracy in the global state failure model—along with infant

Changes to the List of Historical State Crises

The set of crises used in the analyses reported here consists of 127 “consolidated” cases of state failures, of a single type, and complex events involving several different kinds of failure in sequence. This is 14 more than in the initial study. The differences, as compared with the list in the

Table 2: Global Model Results



cases in the Sub-Saharan Africa model had six significant elements.¹¹

Level of Democracy

As with the general model, partial democracies were most vulnerable to state failure. This result again showed a high degree of statistical significance. However, while in the global model full democracies and autocracies were about equally stable, in Sub-Saharan Africa autocracies were slightly more stable than even full democracies—presumably because in Africa full democracies have greater problems managing ethnic conflicts and fluctuations in material living standards than do the full democracies of Europe and North America. In addition—and this is one of our most striking results—we found that the vulnerability of partial democracies to state failure was especially great in Sub-Saharan Africa and much higher than in the world at large. The precise results of this model were that in Sub-Saharan Africa, other things being equal, partial democracies

Key Variables

Key variables measure the following items:

- **Infant mortality.** Although this variable directly captures reported deaths to infants under one year old per thousand live births, it also serves as an indirect measure of a host of broad-based material standard of living and quality-of-life indicators. Infant mortality is strongly correlated with a variety of other variables encompassing economic performance, education, social welfare, environmental quality, and democratic institutions.
- **Trade openness.** This variable is a ratio that measures the value of imports plus exports divided by GDP. Of the other variables analyzed in the first phase of this project, it correlated only with the density of roads—generally accepted as an indicator of economic development—and population size.
- **Level of democracy.** This variable is constructed from information on political institutions. Democratic regimes have competitive political participation, elected chief executives, and significant checks on executives' exercise of powers. The variable correlates closely with indicators of civil and political liberties and also with measures of economic well-being.
- **Regime durability.** This variable is a count of the number of years since the last major, abrupt change in regime. Abrupt shifts toward or away from democracy count as regime changes and reset the duration count to zero. Regime changes that follow state breakdown and civil war also reset the count. Nonviolent transitions from one authoritarian regime to another, or one democratic regime to another, do not register on this variable. Regime duration is correlated with several indicators of economic development, including per capita GDP.
- **Youth bulge.** This variable is a ratio of the population in the 15- to 29-year age bracket relative to that in the 30 to 54-year age bracket $r_1/F15.070$ that in $TDiptSriable. RsTJiT*10.00Ydllo$

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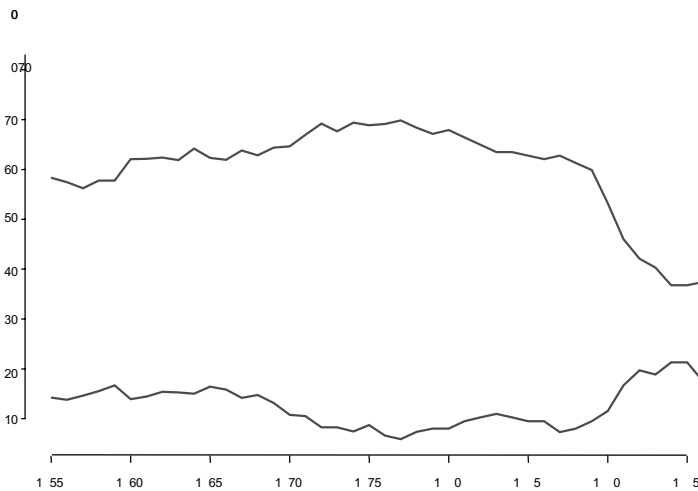
had increased to 71, whereas autocracies had declined to 49. The post–Cold War transition—which Samuel Huntington calls “the third wave of democratization”¹⁶—also has seen the establishment of a large number of partial democracies. In 1996 there were 27 such polities, double their numbers in the 1980s.

The long-run trend by which democracies have come to outnumber autocracies has two sources. One is the significant number of new democracies established in the post-Communist states. The other, and more important factor, is that many countries that tried and failed to establish democratic polities tried again. South Korea, for example, shifted from autocracy to full democracy in 1960, but a year later lapsed back to autocracy. In 1963 it shifted again to partial democracy but returned to autocratic rule in 1980. South Korea’s most recent transition began in the mid-1980s and was completed in 1988 when it became, and has thus far remained, a full democracy. In short, South Korea accounts for three transitions toward democracy and two cases of backsliding to autocracy. Pakistan, Turkey, Thailand, and Bangladesh—all full or partial democracies by 1997—also made three or more democratic transitions between 1955 and 1996.

Transitions are defined in terms of shifts among the three categories of regime type—full democracy, partial democracy, and autocracy. For the analysis of trends, the Task Force defined transitions to democracy as shifts from autocracy to either partial or full democracy as well as shifts from partial to full democracy.¹⁷ These transitions are said to be *stable* if the regime does not regress toward autocracy in the first five years after the initial transition.¹⁸ A regime is *unstable* if it regresses toward autocracy within five years. Thus, a country that changes from autocracy to partial democracy, then two years later transitions from partial to full democracy, is counted as having made one stable transition. A country changing from partial democracy to autocracy and remaining an autocracy for five years is counted as a stable downward transition; whereas a country that shifts from democracy to autocracy, then within five years returns to partial democracy, would be counted as an unstable downward transition.

Four major observations can be made about the evidence:

- **Many democratic transitions do not endure.** Between 1957 and 1991 there were 54 durable transitions— that persisted for at least five years—toward full or partial democracy in independent countries, including 16 democracies established during the period 1989-91 in the Soviet and Yugoslav successor states. Another 20 democratic transitions were attempted between 1957 and 1991 but reverted to autocracy during their first five years. An additional 33 democratic failures—durable democracies that shifted toward autocracy for at least five years— occurred.
- **Post–Cold War democratic transitions may be more durable than earlier ones.** Before 1986, 24 regimes made durable transitions toward democracy, more than offset by 44 failures—reversion to autocracy—of full or partial democracies.¹⁹ The 38 durable transitions toward democracy between 1986 and 1991, however, were offset by only nine failures. A more precise comparison looks only at the outcome of democratic transitions that were attempted between 1957 and 1991. Of the 36 transitions that occurred before 1986, 12 countries (33 percent) reverted to autocracy within five years; whereas, for the 38 transitions in 1986 or later, only eight (21 percent) failed to survive. The short-term survival of democratic transitions thus appears to have increased slightly in the post–Cold War period, although the difference is not quite statistically significant.
- **World regions differ substantially in the success of democratic transitions.**



Variables Tested for the Democratic Transition Models

Demographic

- Infant mortality, normalized
- Secondary school enrollment ratio
- Youth bulge, normalized
- Annual change in infant mortality

Political/leadership

- Ethnic character of ruling elite
- Years national leader was in office
- Regime durability
- Democracy minus autocracy index
- Autocracy index
- Regime duration
- Political rights
- Civil liberties

Economic

- Real investment share of GDP, normalized
- Trade openness
- Land burden
- Real GDP per capita, normalized

Models

In developing statistical models of transitions, the Task Force used a narrower definition of transition than it did for the analysis of trends.²⁰ Because crossing the autocracy-democracy divide was thought to be the more critical transition, and because the number of shifts between partial and full democracy was relatively small, the Task Force decided to limit its statistical analysis to transitions from autocracy to partial or full democracy and those from partial or full democracy to autocracy. In this analysis, models were developed that attempted to answer two research questions:

- What social, economic, and political conditions differentiate countries that make durable democratic transitions from others?
- What conditions characterize countries in which democratic regimes fail to succeed?

These questions are different from the issue of the conditions of “state failure” because the democratic transitions are defined and measured differently from state failures. Moreover, few transitions from autocracy to democracy, and only about half of the transitions from democracy to autocracy, meet the criteria of adverse regime transitions.

Transitions from Autocracy to Democracy.²¹

A total of 39 transitions to democracy were available for analysis and were matched with 68 control cases—autocracies in the same region that did not shift to democracy during the matching years.²² Experts examined the state failure database to identify variables that they thought should contribute to democratic transitions, and statistical tests were used to determine which of them differentiated significantly between the transitions and the controls.

Then various combinations of these variables were analyzed to determine the most efficient set. From more than 60 models analyzed, the one with the highest accuracy included two variables: relatively low land burden—an index that is highest for

Table 5: Democratic Transition Model Results

Autocracy to Partial or Full Democracy		
Key variables	Countries More Likely To Transition	Countries More Likely To Transition
Regime durability	Below median	Above median
Land burden	Below median	Above median
Partial or Full Democracy to Autocracy		
Key variables	Countries More Likely To Transition	Countries More Likely To Transition
Infant mortality, normalized	Above median	Below median
Regime durability	Below median	Above median

Investigating Links Between Conflict and the Environment

The efforts reported here build on a thriving set of research programs at a variety of institutions investigating the environment's role in violent conflict. Early hypotheses centered on environmental degradation and resource depletion directly precipitating violent conflict. Two major sets of case studies in the 1990s suggested that environmental causal pathways to conflict were more complicated. Environmental variables—which alone were neither necessary nor sufficient to cause conflict—were found to play multiple roles along a complex causal chain involving intervening social, political and economic variables.

- *Dr. Thomas F. Homer-Dixon of the University of Toronto found that when “environmental scarcity” of renewable resources did play a causal role, it was most likely to be through impacts that were “sub-national, persistent, and diffuse.” These impacts indirectly contributed to acute conflict by exacerbating more familiar sources of conflict—for example, ethnic divisions or relative deprivation.*
- *Drs. Guenther Bachler and Kurt Spillman, codirectors of the Swiss Environmental Conflicts Project (ENCOP), identified seven types of “environ-mentally-induced conflict” in a typology that distinguished levels of conflict and parties to conflict.*

countries with largely agricultural populations and scarce cropland—and low durability of the regime before the transition. This model correctly classified two-thirds of the cases in a set of 39 transitions and 68 controls. The best three-variable model correctly classified two-thirds of the cases and showed that durable democratic transitions were most likely when infant mortality was relatively stable, autocracy was already restricted, and land burden was low.

These models suggest some interesting substantive findings. The regimes most likely to undergo stable democratic transitions during the last 40 years:

- Already had shifted away from purely autocratic forms of government.
- Tended to have had less durable regimes; that is, they had attempted previous political experiments.

Transitions were also more likely to occur in societies with greater economic capabilities (measured by low land burden) and less short-term variability in quality of life (measured by changes in infant mortality).

Once a country has transitioned to democracy, the Task Force found that the likelihood that the transition will be stable depends on several factors:

- Countries whose democratic transitions are most likely to succeed have greater annual improvement in infant mortality, a lower level of infant mortality, greater trade

openness, a higher proportion of the population in urban areas, and more years of experience as a democracy.

Transitions from Democracy to Autocracy.²³

A total of 35 democratic failures—transitions from full or partial democracy toward autocracy—were available for analysis and were matched with 98 control cases;²⁴ that is, democratic countries in the same region that did not fail during the matching years. The two-variable model with the highest accuracy—nearly three-quarters of cases correctly classified—included infant mortality normalized by world average and regime durability. High infant mortality and low regime durability characterized transitions to autocracy.

It is not surprising that newer democracies—those of low durability—are more likely to fail than long-lived ones, based on the evidence that many democracies fail during their first five years. The role of infant mortality—and by extension, other aspects of quality of life—in raising the prospects for democratic survival is consistent with the results of the general models of state failure.

IV. THE ROLE OF THE ENVIRONMENT IN STATE FAILURE

Goals and Hypotheses

We set out to determine whether the proposition that there is a measurable connection between environmental degradation

season, El Niño–driven droughts were forecast for northeastern Brazil and for Zimbabwe, with more or less equivalent lead times given to decisionmakers and a comparable projected and actual change in environmental resources—rainfall. The vulnerability—the potential drop in agricultural production divided by loss in rainfall—was also about the same. However, the net social impact, or actual loss in output, was very small in Brazil but quite high in Zimbabwe, where 80 percent of the maize crop was lost. Many analysts attribute this difference to different levels of capacity in the two settings. Officials in Brazil acted on the knowledge early, implementing effective strategies, whereas in Zimbabwe the information was never used, and no responsive strategies were developed.³⁰

Findings

Environmental change does not appear to be *directly* linked to state failure. To determine whether it was possible to find a statistical correlation between environmental change and state failure, we tested variables that measured deforestation and freshwater supply, but both failed to generate significant results. This was consistent with our hypothesis that the more direct effects of democratization, trade openness and quality of life—measured by infant mortality—had such a strong impact on state failure that they masked any impact of environmental deterioration.

This result is at odds with recent work by Hauge and Ellingsen,³¹ the only other study we are aware of that employs statistical tests to evaluate claims about the direct impact of

environmental harm on political violence. Hauge and Ellingsen found a significant impact from deforestation, soil degradation, and freshwater access, results that we believe are due to differences in how the dependent variables are operationalized and how the independent variables are used. Some of these differences are potentially large enough to account for the different results by themselves; taken together they make the two models essentially incomparable. Because the state failure model covers a greater time period and includes trade openness as an explanatory variable, we think its results have more validity. Nevertheless, the Hauge and Ellingsen model shows that there is more than one way to approach these questions, and we welcome the opportunity for scholarly debate.

Environmental change is significantly associated with changes in 002 Twi (two models) 13 (ep fcantlyables that mear (chaniu8 fo

Once the data were assembled, we screened potential capacity and vulnerability variables by computing their correlation with infant mortality. Those that were significantly correlated—telephones per capita, population in subsistence agriculture, and land burden—were then tested in combination with an environmental stress variable in a multiple linear regression model.³²

As we expected, deforestation proved to be statistically significant only when tested in a model that included measures of vulnerability and capacity. For given levels of vulnerability, capacity, and baseline infant mortality rates, we found that the greater the loss of forest cover, the higher the increase in infant mortality rate.

The results for the model using soil degradation as the environmental stress were more complex, and no linear relationship could be measured. We obtained significant results, however, by multiplying the rate of degradation by its severity and including it as an interactive term. The results suggest that soil degradation has a negative impact when severe degradation

occurs at a rapid rate; otherwise the impact is positive. One possible interpretation of this finding is that the same practices that induce soil degradation—such as agricultural production—might have a positive net impact, for example, by improving nutrition or incomes, if the degradation does not proceed too rapidly.³³

Insights

One major insight that emerges from the analysis is that available measures of environmental degradation do not currently serve as a direct signal of impending state failure. In part, this is a function of the long, complex chain of association between environmental change and state failure, with a number of factors intervening along the way. Those factors are strong enough to push some societies blessed with benign environmental conditions into failure and to prevent other societies suffering serious environmental damage from slipping into political instability. This finding is also a function of the

Variables Tested for the Environmental Model

Environmental Change

Deforestation
Soil degradation
Change in agricultural land
Access to fresh water (urban, rural, and total population)
Fraction of freshwater reserves withdrawn
Sulfur dioxide emissions
Population density

Vulnerability

Percent of population engaged in subsistence agriculture
Land burden: (farmers per area of cropland) x (farmers per labor force)
Storm damage
Share of national income by lowest 20 percent of population

Capacity

Secondary school enrollment ratio
Adult female literacy
Public expenditures on education
Telephone lines per capita
Bureaucratic quality
Corruption
Number of bribery cases
Law and order tradition
GDP per capita
Debt service
Rail mileage per square mile
Rail-ton miles per capita
Road density

Environmental Data Limitations

Our analysis was seriously constrained by the paucity of available data. Whereas the overall state failure model was able to test some 75 economic, political, and demographic variables, the environment model could test only a handful. This data constraint meant that some important environmental factors could not be examined. For example, water quality—consistently mentioned in the literature as the most serious environmental problem facing developing countries—could not be included because reliable time series data are available for only 38 countries. Air quality suffers from similar deficiencies.

Useful indicators of vulnerability were also scarce. Because the best environmental change indicators—deforestation and soil degradation—that we had were related to terrestrial ecosystems, we were able to rely on vulnerability measures that tapped the degree of sensitivity to agricultural perturbations. However, measures relevant to other environmental shocks, such as declines in air quality, would have been harder to construct.

The available measures of capacity were especially disappointing. The ideal measure, in our view, would take into account the financial resources, quality and extent of infrastructure, and knowledge and skills of public and government officials available for monitoring, assessing, and responding to major environmental problems. Despite the great attention paid to issues of capacity building in recent years,^b we were unable to identify any useful indicators that came close to capturing this concept and, instead, had to rely on proxies that imperfectly measured a few aspects of capacity.

^a Even for these countries, data are taken from single-point monitoring stations.

^b See, for example, the UN Development Programme's Capacity 21 program.

seriously limited data at our disposal. On balance, we cannot say how large an impact environmental damage has on the risk of state failure.

Nevertheless, the results of our analysis provide evidence for an indirect connection between environmental change and state failure. Deforestation and soil degradation appear to diminish the quality of life, as measured by infant mortality rates, for low-capacity states that are socially vulnerable to disruptions in soil ecosystems; and infant mortality has been shown to have a direct impact on the likelihood of state failure.

Caveats on the Findings

While we believe that the results of the mediated environmental model are useful and significant, the model has several limitations:

- The process of converting analytic concepts into measurable variables has necessarily resulted in variables that are more narrow and arbitrary than the analytic constructs that they represent. This is most true for our core capacity variable—telephones per capita, which we recognize to be a very limited measure of governmental and societal response capability—but to a degree it is true for all the variables.
- The findings represent a general tendency that applies to the set of all countries for which data were available, over the ten-year period studied. That does not mean that this tendency will be true for each individual country at every point in time. Some countries might experience far more direct connections between environmental change and state failure than we observe; other countries might experience less connection between environmental change and infant mortality than our results suggest.
- Environmental data limitations mean that our conclusions are far from the last word. We simply did not have measures for some very important environmental changes—including water quality, with its impact on public health—that might prove more significant as precursors of state failure than those we tested. Data constraints also prevented us from testing whether state failure is associated with aggregate processes of environmental deterioration, encompassing the degradation of soil, air, and water systems.

IMPLICATIONS OF PHASE II FINDINGS FOR FORECASTING AND POLICY

The main result from retesting and refining the global model is a solid confirmation of the work undertaken in the first phase of the Task Force's work. Even with an updated and expanded problem set, different control sets, and more refined measures of democracy, the basic global model continued to

accurately classify roughly two-thirds of historical cases. Moreover, the same independent variables emerged as statistically significant in a variety of retests.

The major implication for forecasting is that as far as statistical data are concerned—given current limitations in accuracy and coverage for global data—using a large number of variables does not add to the effectiveness of forecasting models. In many cases, we found that the gaps in either the temporal or geographic range of particular variables were so great that any possible gains in prediction were offset by statistical uncertainties or missing data problems associated with measuring those additional variables. Thus, in all models and regional sub-models, a handful of variables emerged as providing significant power in discriminating between state failures and stable cases over the past 40 years. Although many additional variables—including those measuring nutrition, education, droughts, and civil rights—showed significant correlations with risks of state failure, they did not add statistical power to models based on our key variables. Those variables, which consistently emerged in a wide variety of models, are material living standards, trade openness, and democracy, and in more limited circumstances, youth bulge, regime duration, ethnic dominance or discrimination, and the urban proportion of the population.³⁴ We shall have to wait until the accuracy and coverage of global data series improves before we can gain further accuracy by building more complex models. In the meantime, there is a compelling need to improve global and regional data on these key dimensions, and on many other social, economic, political, and particularly, environmental conditions.

A secondary implication is that the accuracy of statistical models forecasting state failure risks two years in advance remains at a level that is useful, but insufficient for refined predictions. In order to bridge the gap between the two-thirds accuracy of our statistical model, and the better than 90-percent accuracy required for effective policy responses, the skills of individual country analysts and policymakers in assessing rapidly changing local conditions remain absolutely crucial.

The mathematical data analysis cannot prove causality, but the correlations are consistent with causal interpretations. Our findings also suggest policy implications that are interesting and complex, although the best focus and mix of policy responses will, of course, vary from case to case.

Involvement in international trade, as measured by trade openness, is associated with a lower risk of state failure in virtually all states and all contexts. This finding suggests that policies or measures—including internal factors such as dependable enforcement of contracts, modest or low corruption, and improved infrastructure, as well as bilateral or multilateral efforts to eliminate trade barriers—that help to foster higher levels of international trade could help prevent political crises. Interestingly, it appears that it is the involvement in international trade itself, and not the eventual prosperity that such trade provides, that is the key to this effect. The work of Etel Solingen has shown that free trade, if sustained, helps bring together coalitions of elite actors that support the rule of law and stable property relationships, as a condition for building wealth.³⁵ Such

coalitions may or may not be democratic, but in either case, they promote political stability.

Partial democracies—particularly in lower-income countries where the quality of life remains poor—are associated with elevated risks of failure. Although full democracies and autocracies are fairly stable, the in-between forms of government are at high risk of undergoing abrupt or violent change. This suggests that while a policy of promoting democracy may eventually lead to a world of stable liberal states, one cannot presume that the inevitable intermediate stages will also be stable. Policymakers need to be particularly attentive to the risks of failure in such states, and should seek and encourage progress toward full democracy. Moreover, if helping to increase the odds of stability in such states is a goal, then policymakers need to focus on developing policies that help foster international trade and on supplementing democratization programs with broad development programs that help improve the overall level of material living standards.

Material living standards have an undeniable effect on the risks of state failure. In some models, it is the overall level of material living standards that emerges as important; in other models, such as that for Sub-Saharan Africa, it is the direction of change that appears crucial. In either case, the policy implication is that efforts to improve material living standards are a significant way to reduce risks of state failure. In Sub-Saharan Africa, it turns out that high levels of urbanization reinforce this effect—for states with high levels of urbanization, states experiencing growth in GDP per capita have only a fraction of the risks of state failure of those states experiencing economic stagnation or decline.

Despite the prevalence of ethnic conflicts—especially in Sub-Saharan Africa—ethnic discrimination or domination is not the sole, or even the most important, correlate of state failure. Because ethnic factors do not emerge as the most powerful—or most statistically significant—factors associated with state failure, they bear monitoring, but other policy levers may be more readily available and more effective.

Environmental stress, vulnerability, and capacity form an interdependent triad that affects quality of life and, indirectly, the risk of state failure. Our findings imply that analysts concerned with the social impact of environmental change need to monitor not simply the environment, but also changes in a country's vulnerability to environmental changes and its capacity to cope effectively with them. The increased appreciation of the need to develop indicators of environmental change and of sustainability should be complemented with equally vigorous efforts to develop useful indicators of vulnerability and capacity, where the recent track record has been less encouraging. At the broadest level, our findings also suggest that when it comes to minimizing declines in quality of life, increases in capacity and reductions in vulnerability are equally appropriate targets for policy intervention as increases in environmental protection.

Newer democracies, especially in countries where quality of life is relatively low, are more likely to fail than long-lived ones. The Task Force's models and data can be used to inform policymaking about the conditions under which democratic

chemical hazards.

- Developing models that capture regional variation—or localized “hot spots”—within a country that are masked by national level analysis. We know that the environmental impact on material quality of life will be stronger if there is a spatial correlation among the variables. For example, if a given unit of land has a high rate of deforestation, a high land burden, and poor institutional capacity, we would expect a larger local impact on infant mortality, an hypothesis that could be tested using currently available high-spatial-resolution data sets.
- As additional data become available, continuing to test the hypothesis that environmental damage directly contributes to the likelihood of state failure.
- **Developing a more detailed concept of “state capacity” to test as a mediating factor in general and regional models.** Building on the results of the mediated environmental model, further examine and develop in more depth the concept of state capacity, develop quantitative measures that tap this dimension, and incorporate this concept as a mediating factor. We should also seek or develop data sets that are better able to capture state capacity.
- **Investigating the usefulness of pilot studies of event data for bridging the gap between model-based risk assessments and “early warnings.”** The general models of state failure identify risk factors measured two years before the expected onset of failure. Even the best models identify a substantial number of false positives and fail to predict correctly some failures. The goal is to supplement general models with early warning models that track the immediate precursors of failure and provide more accurate and timely warnings than do risk assessments that are based on background conditions. Specifically, monitoring of events