GAME REPORT

ENVIRONMENTAL SECURITY AND PREVENTIVE DEFENSE

John Auger

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Author
John Auger

Editor
Kent H. Butts

Composition
Mrs. Mary Jane Semple

Cover Artist
Mr. James E. Kistler

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Comments pertaining to this report or requests for additional copies, are invited and should be forwarded to: Center for Strategic Leadership, U.S. Army War College, Carlisle Barracks, PA 17013-5049. Comments may also be conveyed by electronic mail to perryj@csl-emh1.army.mil or by calling (717) 245-3226 or DSN 242-3226.

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FOREWORD

The strategy of Preventive Defense is built on the premise that defense establishments have an important role to play in building democracy, trust and understanding, and in addressing problems that lead to regional tensions or in promoting communication and cooperation. Defense environmental cooperation can support this essential component of our national strategy. In light of this, the Office of the Deputy Under Secretary of Defense (Environmental Security) asked the Center for Strategic Leadership, U.S. Army War College to address environmental degradation and scarcity and the role they play in the causes of conflict and instability in the post--Cold War world. In late May, the Center for Strategic Leadership conducted a Game to develop and analyze policy options for addressing a hypothetical environmental problem set in Eastern Europe. The Game brought together an international group of experts on environmental issues and policy makers from Academia, the private sector, and the Washington Interagency Community to meet in a "nonattribution" environment to craft multi-lateral, multi-disciplinary, interagency and interdepartmental approaches to the security challenges posed by environmental issues.

Using the advanced technological capabilities of the Army War College's Collins Hall, the participants developed, discussed, and commented on a broad range of issues. The results of their efforts are compiled in this report.

The Center for Strategic Leadership is pleased to have hosted this game on Environmental Security and Preventive Defense in collaboration with the Office of the Deputy Under Secretary of Defense (Environmental Security). We hope that the ideas and concepts presented

herein will contribute to a better understanding of environmental problems and their linkage to the U.S. strategy of Preventive Defense.

GARY D. VEST
Principal Assistant
Deputy Under Secretary
of Defense
(Environmental Security)

DOUGLAS R. CAMPBELL
Professor
Director, Center for
Strategic Leadership
U.S. Army War College

CHAPTER I

INTRODUCTION

Introduction

The U.S. Army War College Center for Strategic Leadership conducted a gaming exercise on Environmental Security and Preventive Defense on May 21st, 1997, at Carlisle Barracks, Pennsylvania. The game was scheduled to coincide with a meeting of the NATO Committee on the Challenges of Modern Society Pilot Study on "Environment and Security in an International Context." This facilitated the participation of a broad spectrum of environmental and policy experts from throughout Europe to join with similar experts from Canada and the United States to develop and analyze policy options for addressing a hypothetical environmental problem set in Eastern Europe. See Appendix A for a list of participants. The Game thus brought together an international group of experts on environmental issues and policy makers representing Academia, the private sector, the military, civilian government, and members of the Washington Interagency Community to meet in a "nonattribution" environment to craft multi-lateral, multi-disciplinary, interagency and interdepartmental approaches to the security challenges posed by environmental issues.

The Collins Hall venue provided a sophisticated suite of computer programs to enhance the participants' analysis of and dialogue on a broad range of environmental problems and their policy implications. The U.S. Army War College's policy of non-attribution promoted a full and frank discussion of the issues and helped add to the depth of analysis and understanding for the group.

Objective

The objectives of the exercise were to develop a prioritized list of regional environmental security problems and NATO policy options for proactively addressing such issues, and to enhance the group's sensitivity to the varied international and interdisciplinary perspectives on this important topic. The focus was on interagency cooperation and approaches to coordinating interaction between and among interagency and international actors. The agenda was crafted to further educate the participants, to provide an opportunity to inform each other and share insights from diverse viewpoints, and to provide an opportunity for creative and critical thinking. The scenario, set in Southeastern Europe, was designed to draw upon the subject matter expertise of the participants. See Appendix B, Agenda.

Methodology

The game required participants to role play international policy advisors, to participate in bilateral and multilateral negotiations, and to develop group consensus on environmental priorities in order to create an enhanced awareness of the multifaceted issues involved in environmental security. The participants were organized into groups representing the North Atlantic Treaty Organization, Eastern Europe, and the hypothetical countries of Saphire and Rudyard in order to provide a spectrum of views and approaches to addressing questions of environmental security.

Organization and Tasks

The game coordinator began the game with an explanation of the overall game structure and its objectives. See Appendix C. An introductory video was used to provide a hypothetical scenario to the participants. The purpose of the scenario was to provide a plausible backdrop for an examination and discussion of environmental issues and their potential impact on overall security. Although the

scenario for this exercise was set in Eastern Europe, it could have been portrayed in many parts of the globe. As noted above, an objective of the exercise was to draw out the participants on environmental issues and their impact on security, and this hypothetical scenario was a vehicle to accomplish the game's objective.

The first task for the participants was to examine the regional/national security interests from the perspective of their assigned regional or country game team. Once these interests had been agreed upon by the team, they were to develop the environmental dimensions of those interests. Using this as a framework, each team was to determine what policy options it would want NATO to undertake unilaterally, bilaterally, or multilaterally to address these environmental interests and to help the team achieve *its* interests. Each team then negotiated with the other player groups to attempt to find common ground and to determine which policy options would have the greatest potential for success. After the negotiations, the group considered all inputs and refined their final policy recommendations which were then presented to the entire group.

The second phase of the exercise required participants to eschew their role-player personas and to examine environmental issues in Europe from their own unique national and institutional perspectives. The team was then to come to consensus and to *identify and prioritize environmental issues that could become security threats*, or, conversely, *could be used as confidence building measures to promote regional security*. Having done this, they were again to develop recommended policy options that NATO could take to address these issues. They then formally presented these recommendations to the assembled group.

The final component of the exercise allowed the combined group to prioritize all the environmental problems that the four teams had identified. Using the GroupSystems V software suite, the participants were able to independently and anonymously identify their personal assessment of the top environmental issues facing NATO.

The computer then aggregated the individual results and displayed the group's consensus ranking.

Scenario

A CNN type news broadcast was used to introduce the scenario to the game participants. As noted above, the scenario was designed to be both hypothetical and plausible. Its purpose was to stir critical thinking and stimulate discussion. What follows is the essence of what the participants were presented in the broadcast. At Appendix D is additional information which they were provided to help more fully develop the scenario.

A news network reports that an unfolding security crisis in the Southeastern European country of Saphire was caused by an environmental problem.

Following its liberation in early 1945, the People's Democratic Republic of Saphire (See Figure 1) was formed and immediately came under the influence of the Collective Party of Saphire (CPS). As an original member of the Rudyard led Eastern Alliance, Saphire hosted a small number of Alliance forces serving as a bulwark on the southwestern frontier of the organization. During the period of Collective rule, a number of medium and heavy industries were introduced to the country, which had previously been predominately agricultural. These included steel, food processing, textiles, and chemicals. Saphire still remains dependent on

Following the fall of the Berlin Wall, Saphire underwent a relatively peaceful political revolution as it transitioned under a caretaker government to a multiparty parliamentary democracy. The new constitution of the Federal Republic of Saphire came into effect in March 1992 and the first free elections were held in September of that year. The first freely elected government was controlled by a plurality of delegates from the Collective Party of Saphire (CPS), who ruled in coalition with several slowly developing centrist parties. The initial coalition has faltered and the centrist parties have begun to seriously challenge the CPS

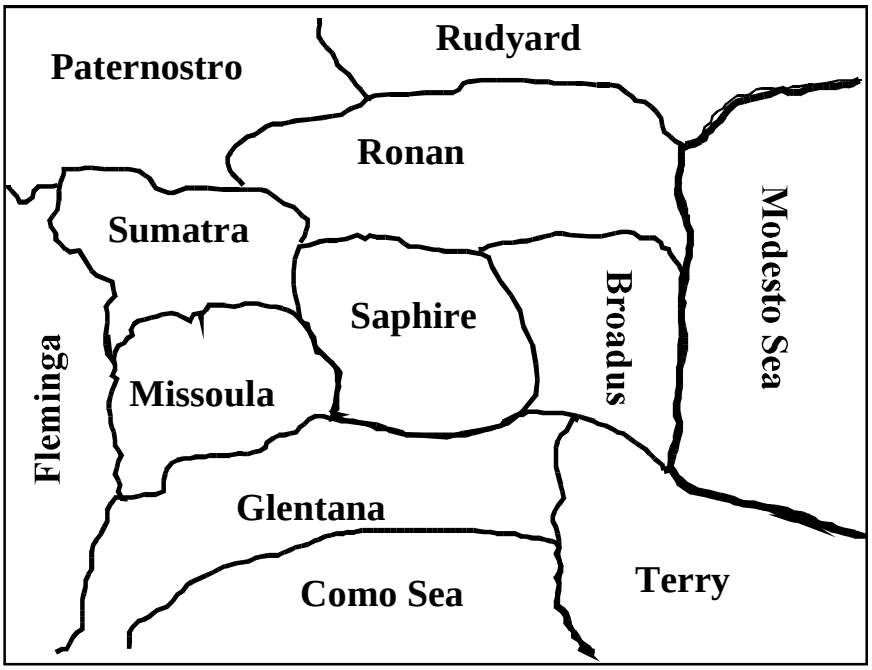


Figure 1.

in subsequent parliamentary elections. Also, several fringe and ethnic parties have begun to make their presence felt in some of the local government elections. Some of the new government's early actions were to begin to privatize local industry, introduce basic financial and commercial institutions, and develop some basic land reforms. As with many of the former Eastern Alliance states, the years of centralized economic planning had allowed inefficient firms and obsolete plants to continue operating long after they needed to be replaced for economic, environmental, and occupational safety reasons. The opening of local markets to competition initially proved disastrous for domestic firms and industrial production has contracted for several years, though the rate of contraction has slowed substantially in the past 2 years.

Tensions have reached the boiling point within the Federal Republic of Saphire. Internal demonstrations have caused border disputes with the neighboring countries of Glentana, Sumatra and Ronan. Widespread civil unrest

has been brewing in Saphire since the World Health Organization announced early this year that infant mortality and birth defects, within Saphire, can be linked to the government sanctioned chemical industry.

Ethnic extremists, from the culturally separate northern provinces of Saphire, namely the Ronanian, Broadusian and Sumatrans have used this information to fuel anti-government sentiment throughout the country. Environmental degradation is being blamed on the Saphirian manufacture of EMBS (ethyl-methyl biostimulants). EMBS was an isomeric plant hormone developed by the U.S. Phytofun Corporation that could be used as a foliage enhancer or a defoliant depending on the specific chemical structure. In the U.S. EMBS was used as a defoliant, however it was slow acting and was soon replaced by the herbicide orange family of defoliants. The former Peoples Democratic Republic of Saphire established an export market for EMBS and has used the chemical on its own crops since the 1950's.

The government of Saphire has denied these reports. In public statements the prime minister of Saphire, Galena Septicova, has denied reports of widespread environmental degradation, and stated that "every reasonable precaution has been taken to ensure the health of Saphirian citizens." Despite these reassuring statements environmental groups have pointed out many hazards to humans and wildlife that stem from the production of EMBS. According to the Greenpeace environmental organization, EMBS has caused a poisoning of formally productive agricultural areas. A build up of heavy metals has been noted in crops, livestock and humans, they also claim that EMBS and its resultant heavy metal (vanadium) concentrations were the cause of pollution in the Wise River downstream from Saphire, resulting in fish kills in Broadus and Sumatra. These same pollutants are flowing into the Modesto Sea and threatening coastal areas of the Ukraine and Rudyard.

However, these are not the only environmental problems causing tensions. In protesting the criticism and sanctions of neighboring states, Saphirian officials have been quick to

point out that the massive industrial and coal fired power plant emissions of the neighboring Missoula-Glentana industrial basin have resulted in acid rain that has devastated large areas of forest in southern Saphire. Saphirian officials have claimed that the economic and wildlife habitat losses caused by this air pollution are greater than the alleged damage caused by EMBS and they are demanding that these emissions be curtailed before Saphire ceases production of EMBS.

The Saphirian economy is now suffering due to mistrust by nations that import Saphirian agricultural goods. Governments within the region have begun to embargo food stuffs from Saphire pending tests for EMBS and heavy metals. Several European environmental groups are pressing for a ban on Saphirian agricultural products and the Italian government has announced that it may soon be forced to embargo imports of Saphirian beef products completely.

Saphirian environmental problems are not just external. The environmental situation in Saphire has caused internal strife and tensions leading to violence. On 18 May local newspapers carried a story about an EMBS leak at the EMBS plant in Kiowa. Workers at the plant were said to be in open revolt over plant policies and refused to work. Simultaneously at the northern Saphirian city of Mercury, the Butte nuclear plant was closed and workers were not allowed to leave the facility. The plant had long been considered a safety hazard, and lacked emergency management and evacuation plans. Mainstream public opinion is that a nuclear accident has occurred at Butte and that soon neighboring areas will be affected. There has been no confirmation of any accident and Saphirian officials have stated that they are only trying to protect their energy employees from the eco-demonstrators.

This situation coupled with the growing distrust in the Saphirian government has spawned massive demonstrations, violence and mass exodus from northern cities. Rioters are armed and have in more than one case confronted military and police officials. Refugees have

begun to clog the border crossing sites between Saphire and Sumatra, Ronan and Glentana., and some have been reported arriving in refugee centers as far away as Germany.

These bordering countries have filed official protest with the Saphirian Department of State. The border dispute with Glentana has fallen just short of a military confrontation. The Glentana military, which had been discovered illegally smuggling low cost, EMBS contaminated Saphirian beef into the country, has hardened its position. Glentana has initiated military maneuvers within 5 kilometers of the border and has launched aircraft to provide a show of force. Saphirian air defenses have been tracking the Glentanian aircraft leading to speculation over Saphirian intentions. High level Glentanian military officers privately see this as an overt act of war.

The political implications of the Saphire environmental crisis are beginning to be appreciated and several state and non-state actors are now offering their assistance. According to its press release issued today, NATO wishes to address the issue. "The North Atlantic Council (NAC) is concerned that the un-addressed environmental problems of eastern Europe and other areas strategically important to NATO security, are constraining free market economic growth, promoting ethnic strife, and placing difficult demands upon the resource constrained, newly democratic governments. In spite of the fact that NATO remains involved in the out of area, U.N. sponsored peacekeeping operation in the Balkan state of Sumatra, the North Atlantic Council (NAC) announced that it will convene a special session of the North Atlantic Cooperation Council (NACC), in Brussels to examine environmental security problems such as those in the newly Democratic Republic of Saphire.

Believing that environmental problems left unresolved can lead to security problems, the North Atlantic Council (NAC) hopes to discover a role for NATO in proactively addressing environmental security issues, thereby

enhancing stability, economic growth and democratic values in this strategically important region. It has therefore requested that representatives from Saphire, Rudyard and eastern Europe attend the NAC summit and, along with a NATO task force, offer their recommendations on what NATO could do to prevent similar environmental security problems in the future. NAC officials are particularly interested in hearing from the Rudyard representatives. They believe that similar environmental problems are common to all European countries and cooperating on their solution could be a confidence building measure to promote contacts between NATO and Rudyard. This they hope, would lead to a new era of cooperation between former antagonists.

Rudyard would also like to assist. Vladmir Pavloc from the Rudyard foreign ministry was interviewed today and issued the following statement: "We have a great interest in the Saphirian problem. First, there is a small enclave of Rudyard nationals in Saphire. Due to environmental problems they have begun to repatriate to Rudyard and are further aggravating our unemployment problems. In addition, it is promoting tension between former allies and stirring up age old ethnic tensions. Rudyard does not want this; we need stability in our border areas, not conflict that could draw in outside arms or money to protect minority ethnic or religious interests. But also, Broadus, Saphire, Sumatra and Ronan are important markets for Rudyard energy resources and spare parts products. The economies of the region are fragile; environmental problems such as these can easily erode investor confidence and the private foreign investment necessary to promote growth. Failed economies mean failed states and a loss of markets for struggling Rudyard industries; also, our economic security has been directly affected by what our scientists believe is EMBS contamination of our coastal estuaries along the Modesto Sea. We are offering to lead negotiations aimed at resolving the crisis, or to participate with other institutions seeking to broker solutions."

Citing the membership of Ronan, Broadus, Glentana, Terry, Missoula and Sumatra in the Southeastern European Cooperation Initiative (SECI), and its institutional aims of fostering regional cooperation on environmental and economic issues, and encouraging private investment, SECI Coordinator, Dr. Hans-Dietrich Engel, former prime minister of Switzerland, offered SECI's assistance in brokering an accord. The U.N. Economic Commission for Europe is offering to contribute technical support for SECI's effort. Dr. Engel said that he was hopeful, in part, because of SECI's success in moderating the Missoula-Glentana dispute. The successful peace accords that resolved the long-standing Missoula-Glentana border dispute began when the two former antagonists agreed to SECI sponsored bilateral talks aimed at resolving common water pollution problems associated with the Missoula-Glentana industrial basin.

Concluding Thoughts

One of the most valuable aspects of this game was that it offered a unique opportunity to capitalize on the broad base of experience, knowledge and perspectives represented by the group. By reaching out to such an eclectic group of interested agencies, institutions, and countries, creative and fresh multi-disciplinary, multi-lateral, interagency and interdepartmental approaches were brought to bear on a challenging, perplexing problem. There was clear value in sharing national, institutional and individual values and perspectives while exploring creative policy options. Throughout this game, there was a tremendous broadening of perspectives and a better understanding of alternative, creative approaches to dealing with environmental issues and their impact on security. These insights can lead to a more stable and secure international environment.

CHAPTER II

GAME RESULTS

Phase 1 - Role Playing and Negotiations to Develop Interests and Policy Options

The four heterogeneous teams (Saphire, Eastern Europe Rudyard, and NATO) used the hypothetical scenario as a backdrop to develop their national/regional interests and to identify the environmental issues associated with those interests. Each group's first task was to agree to a set of interests and the environmental dimensions of those interests. Using this as a basis, each team then developed policy options which, if implemented by NATO, would help the team promote its own interests. These policy options were refined through a series of negotiation sessions with the three other gaming teams in order to establish which policy options would have the greatest potential for success. The information and ideas gleaned from the negotiating sessions were then considered in the team's final listing of policy options for NATO to implement. This final list was then briefed to the entire group.

Saphire

The Saphire Team identified the following national interests (Figure 1) that they wanted to pursue and cataloged some of the environmental issues which impacted on those interests. The interests and their associated environmental issues included *creating economic growth by protecting its market share and ensuring that Saphire remained a net exporter of food.* A second interest was to *maintain national viability/survival.* A third interest centered on a desire to i*mprove public health*. The final national interest identified by the Saphire team was to

ensure *regional stability* which would be done by *obtaining friends and allies (NATO and Southeastern Europe Cooperation Initiative).*

Saphire Interests

- Create Economic growth
  - Protect Market Share
  - Net Food Exporter
- Maintain National Viability/Survivability
- Improve Public Health
- Regional Stability

Figure 1

The environmental issues associated with the identified interests are indicated on the following chart (Figure 2):

Interests And Environmental Dimensions

- Create Economic Growth
  - Movement of Toxins
  - Current economy depends on hazardous material
  - Establish communication between government and private sector
  - Health of the work force
- Maintain national viability/survivability
  - Review role of nuclear power plants
  - Investigate EBMS conversion
- Improve Public Health
- Refugees/Migration
- Infant mortality/birth defects
- Water contamination/pollution

- Regional Stability
  - Environmental cooperation
  - Attention to acid rain
  - Unilateral actions on water quality

Figure 2

The Saphire team then presented policy recommendations for NATO to the NACC. (Figure 3) These policy recommendations were designed to assist Saphire in achieving its interests in this matter. The policy recommendations included c*oordinate with UN on refugees.* The thrust of this recommendation was that NATO would coordinate with the UN Security Council to solve the refugee crisis. Saphire recognized that this might entail other nations' forces *controlling their borders militarily* but they felt this was a decision for the Security Council. They also recommended that NATO *serve as the liaison for humanitarian aid* with international organizations. Saphire asked for a third party delegation to perform an environmental survey in Saphire. This delegation should include membership from Eastern Europe, Rudyard, and NATO. Also, NATO should initiate a *Pilot Study on environmental clean-up efforts.* The Pilot Study should look at the region in general but with a specific focus on Saphire; however, it is important that it maintain a regional perspective. NATO is also requested to a*ssist in the coordination of financial support. NATO* is also requested to *help develop crisis management planning, e.g. nuclear and industrial accidents*. The team would also like NATO to c*onduct a regular review of the regional security and environmental situation in NATO bodies*. Saphire hoped that this would become a regular on-going dialogue within the North Atlantic Cooperation Council on these matters as well.

Policy Recommendations to Nato

- Coordinate With UN on Refugees
- Control the Borders Militarily
- Serve as the Liaison for Humanitarian Aid
- Pilot Study on Environmental Clean-up Efforts
- Assist in the Coordination of Financial Support
- Help Develop Crisis Management Planning, e.g. Nuclear and Industrial Accidents
- Conduct a Regular Review of regional Security and Environmental Situation in NATO Bodies

Figure 3

Discussion followed concerning the Saphirian desire for NATO to take on many of the coordination efforts. Saphire desired this because of the financial means and technical competencies which NATO possessed. It was asked why the OECD or the UN were not better suited than NATO. It was recognized by Saphire that many of these issues would have to be taken to the UN Security Council.

Eastern Europe

The Eastern European Team identified the regional interests that it wanted to pursue. (Figure 4) The first was to p*romote regional stability* in terms of *economic, social, political, and security*, and r*elations with Rudyard.* The Eastern Europe spokesman also identified the interest of p*rosperity of individual countries in the region.* Their final interest was the *health and welfare of their people.*

Eastern European Interests

- Promote Regional Stability
  - Economic
  - Social

  - Political
  - Security
  - Relations with Rudyard
- Prosperity of Individual Countries in the Region
- Health and Welfare of People

Figure 4

The East Europe Team identified the following environmental considerations which impact directly on their interests in this scenario. (Figure 5)

Interests and Environmental Dimensions

- Promote regional stability
  - Nuclear safety
  - Minimize migration/refugee flow
  - Cross-border contamination
- Prosperity of individual countries in the region
- Sustainable economic development
- Health and welfare of people
  - Food quality and safety
  - Safe water and air

Figure 5

The East European recommendations included (Figure 6) to NATO to solve the environmental problems in Saphire include *NATO issuing a policy statement* that *reaffirms Saphire's sovereignty, supports only peaceful resolution,* and *invites Rudyard to co-chair a pilot study.* The next recommendation was that the *NATO/Partnership for Peace (PfP) program offer to establish/monitor buffer zones on sensitive borders.* Another recommendation was that NATO *develop/sponsor a forum for discussions among nations involved in regional environmental disputes (invite*

Saphire to present concerns). Also, they requested *NATO/PfP participation in outside monitoring and assessment of military/industrial practices and pollution.* As a long term recommendation, Eastern Europe would like NATO to c*onduct a pilot study on the conversion of dangerous environmental military/industrial sites.* Rudyard could be involved in this because of Rudyard's economic interests in the outcome of the Saphirian situation. NATO needs to p*repare to discuss a staged reduction of the embargo, as Saphire demonstrates compliance with international environmental and health standards.* As a part of this, NATO should *offer or support economic incentives to offset loss of income from EMBS production* and *offer food aid to halt internal consumption of contaminated food.*

Policy Recommendations to NATO

- Issue Nato Policy Statement
  - Reaffirm Saphire's sovereignty
  - Supports only peaceful resolution
  - Invites Rudyard to co-chair pilot study.
- NATO/P*fP Offers to Establish/monitor Buffer Zones on Sensitive Borders*
- Develop/Sponsor Forum for Discussions Among Nations Involved in Regional Environmental Disputes (Invite Saphire to Present Concerns
- Nato/PfP Participation in Outside Monitoring and Assessment of Military/Industrial Practices and Pollution
- Conduct Pilot Study on Conversion of Dangerous Environmental Military/Industrial Sites.
- Prepare to Discuss a Staged Reduction of Embargo, as Saphire Demonstrates Compliance W/ International Environmental and Health Standards

- Offer/support economic incentives to offset loss of income from EMBS production
- Offer food aid to halt internal consumption of contaminated food

Figure 6

A question was asked about the funding for the actions that Eastern Europe was recommending. It was noted that since these safety and other issues impact on nearby NATO countries, it is up to NATO to determine how deeply they want to be involved. Another participant wondered what was the purpose of moving military forces to the Saphire border. The response was that the potential for military conflict seems to be of sufficient magnitude to make the stationing of forces a prudent move. To what extent would Eastern Europe be comfortable with Rudyard having a significant hand in addressing some of these issues, such as leading the pilot study? The Eastern European team is interested in stable relations with Rudyard. Also, it is important to understand that Rudyard wants to be of assistance in solving the problems, but the Eastern European team feels it is up to NATO to determine how much Rudyard would be involved. The involvement of Rudyard and the solution of some of these problems could help to promote better relations between the countries of Eastern Europe and Rudyard.

Rudyard

The Rudyard Team had three main interests on which they focused: *National Survival, Regional Stability and Economic Well Being.* (Figure 7*)*

- ational Survival
- Regional Stability
- Economic Well Being

FIGURE 7

In light of these interests, they identified the following environmental issues which impacted on their interests as indicated below (Figure 8):

INTERESTS AND ENVIRONMENTAL DIMENSIONS

- Regional Stability
  - Protection from Chemical Disasters
  - Potection from transboundary pollution
- Economic Well Being
  - Protection from transboundary pollution
  - Renovation of Chemical Plants
  - Renewable Resources Availability
  - Access to Markets
- Protect Ethnic Population In Saphire
  - Target Assistance
  - Manage Potential Migration Problem
- National Survival
  - Protection from chemical disasters

Figure 8

They noted that transboundary pollution is a serious problem and that it is one that feeds a number of other problems and could be a cause of conflict. Another key issue which they highlighted is the need to protect the ethnic Rudyardian population in Saphire. They have already asked for Saphirian assistance in managing any potential migration problems and in ensuring the safety, health, and welfare of all ethnic Rudyardians in Saphire.

The following figure (Figure 9) depicts Rudyard's recommendations:

POLICY RECOMMENDATIONS TO NATO

- **Rudyard in Lead, Nato Funds**
  - Scientific/Technical
  - Assess Nuclear Power Plant in Saphire
  - Support Cooperative/Multilateral Monitoring
  - Technological/Cleanup Support
- Military
  - Demand Glentana Cease Hostile Actions
  - International Peacekeeping Forces
- Political
  - Sponsor a Bilateral Conference on Saphire in Rudyard
- Economic
  - Saphire Ensure Safety of Rudyardian Ethnics in Saphire

Figure 9

The team believed that Rudyard needed to maintain its influence in Saphire and throughout the region because of its historic connections and special ties. However, it did need NATO assistance in not only funding actions in the area but also in terms of scientific and technical aid. Most prominent in this regard was the need for an international team to assess the nuclear power plant situation in Saphire. With regard to the military recommendations, Rudyard believes that it needs the support of other nations in demanding that Glentana cease hostile actions. Rudyard is also prepared to take the initiative in preparing an international peacekeeping force for the area.

There were a number of comments and questions concerning the Rudyardian proposals. Most attendees were intrigued by Rudyard's pronouncement that it would take the lead in all actions but that NATO would bear the majority of the costs. It was asked whether this also pertained to the proposed peacekeeping operations, and the current situation in Bosnia was used as an example of where a Rudyard like country participated in a

peacekeeping operation without being funded outside the normal UN funding system. The Rudyard team in return asked if NATO could do it without Rudyard's support. It was then asked why did Rudyard need NATO. To which the reply was that NATO also had an interest in the area and that Saphire had asked Rudyard to take a prominent role in solving these issues. A final question concerned the role of NGOs and PVOs in addressing the situation and how amenable Rudyard would be to seeing them involved. The Rudyard position was that they and any other organizations were welcome to be part of the solution.

NATO

The NATO Team identified the following interests (Figure 10):

NATO INTERESTS

- Viability of Borders
- Regional Stability
- Refugee Control
- Health/Welfare
- Regional Economy/Stability
- Maintain a Dialogue With PfP States

Figure 10

The team believed that it was essential to retain current national borders as they are now to maintain stability in the region. Another aspect of maintaining stability is the control of refugees. The NATO team envisaged no requirement to send NATO forces to guard borders or to control the flow of refugees. Also of concern to NATO was the maintenance of strong economies in the region coupled with no economic dislocation. Additionally, throughout this crisis they wanted to maintain a positive dialogue with all

Partnership for Peace states and to include them in the overall solution to the region's problems.

The NATO team identified the following environmental issues associated with these interests. (Figure 11)

INTERESTS AND ENVIRONMENTAL DIMENSIONS

- Potential Transboundary Environmental Negative Impacts of Chemical and Nuclear Contamination
  - Water
  - Food/Agriculture
  - Air

Figure 11

The NATO team identified the following policy recommendations with regard to each of the other three actors: Rudyard, Saphire, and Eastern Europe (Figure 12).

NATO POLICY RECOMMENDATIONS

- Rudyard
  - Confirm NATO's Legitimate Interest
  - Concern about Military Operations
  - No Droit de Regard (No Right of Influence)
  - Arms Sales as Agenda Item
  - Support NATO/Rudyard Regional Conference
  - Continue OCSE Action
- East Europe
  - Facilitation and Engagement of Non-Military Resources
- Saphire
  - Implementation of Confidence and Security Building Measures
  - Encourage 3rd Party Assessment

– Encourage Adherence to PfP Principles

Figure 12

Attendees wondered if there was a need for a NATO conference, who should take the lead? The NATO team envisaged both NATO and Rudyard sharing the lead. What would be the goal of the Rudyard/NATO Conference? The team believed that the conference would assist in NATO's primary concern: Stability in the region. An attendee wondered if the team had ruled out a NATO presence in the dispute? Was there any need for NATO involvement? The team believed that NATO needed to be involved politically and in offering technical assistance but it ruled out the involvement of NATO troops. With regard to the third party assessment, who would perform this role? The Organization on Security and Cooperation in Europe was deemed to be an ideal candidate for this.

Phase 2 - Identify Environmental Issues/Security Threats and NATO Policy Recommendations

Using the morning's discussions as a catalyst, participants were asked to step out of their role playing positions and to identify and prioritize environmental issues that could become security threats, or, conversely, could be used as confidence building measures to promote regional security. These issues were termed environmental challenges. The morning's scenario had been meant to suggest some, but the participants were asked to review the actual situation in Europe to identify real environmental issues and what might be appropriate NATO responses.

Team One

The team which had represented Saphire offered the following list of environmental issues. (Figure 13)

ENVIRONMENTAL CHALLENGES

- Use of Natural Resources
  - Land, air, water, biodiversity, deforestation, soil erosion
- Policy/other
  - Environmental terrorism
  - Land mines
  - Lack of sound environmental policy
  - Unsustainable consumption
- Pollution of All Kinds
  - Air, soil, water - from chemicals, nuclear waste, hazardous materials
- Human Interventions
  - Over population
  - Refugees/migration
  - Climate Change
  - Disasters

Figure 13

With regard to NATO policy options, the team reminded the group that NATO was not an environmental organization. However, it presented the following list of actions (Figure 14) that NATO could undertake to mitigate environmental issues.

NATO POLICY OPTIONS

- Coordinate Sound Management Policies Amongst Militaries
- Assist in elaboration of international environmental security regimes
- Develop common technologies to deal with UXO (unexploded ordnance), nuclear waste, and other hazardous materials.
  - demonstration projects
- Widen the dialogue on security/environmental relationship
  - Help to coordinate with NGOs and international organizations
  - Public and media
- Develop a new strategy for the future
- Planning for the problems of the future
- Monitoring of the environment with NATO intelligence assets
- Coordinating emergency planning for refugees and disasters
- Funding for new endeavors
- Improve environmental measures in nato plans, operations, and field exercises

Figure 14

With regard to demonstration projects and their funding, it was noted that there was resistance in NATO to funding new projects. NATO might be useful in helping to facilitate funding, but when new requirements were identified, they should be matched with funding sources anywhere in the world. There were organizations that might fund new demonstration projects but funding should be sought outside of NATO.

Team Two

The East European team offered the following compilation of environmental challenges. (Figure 15)

ENVIRONMENTAL CHALLENGES

- Nuclear Safety
  - Smuggling, waste, accidents,
- Natural resources limitations
  - Water supplies/sources, energy
- Agricultural runoff
  - Fertilizers, pesticides, erosion
- Industrial conversion
  - High pollution producing industries, industrial accidents, acid rain, hazardous cargo
- Climate change
  - Long term issue is greenhouse effect, weather patterns, global warming, rising sea-levels
- Consumption patterns
  - Food, fuels, metals

Figure 15

To address these issues, the team suggested the following policy options. (Figure 16)

NATO POLICY OPTIONS

- Develop a nuclear accident response plan
- Expand IAEA supervision of nuclear facilities in PfP countries
- Establish a monitoring system to assess preventive measures that will reduce the possibility of conflict
- Address the seriousness and relevancy of environmental security issues

Figure 16

It was suggested that the group might also consider a policy option that focused on the prevention of nuclear accidents. It was noted that Finland has developed a capability to address some of the design flaws of Soviet style reactors. It was also pointed out that nuclear reactors pose a greater threat than did the combined destructive power of both NATO and the Warsaw Pact during the cold war.

Team Three

The former Rudyard team developed an inventory of environmental issues that could impact on security in Europe. Figure 17

ENVIRONMENTAL CHALLENGES

- Access to Fresh Water
- Increasing Population Pressures — Migration
- Emerging Diseases, e.g., TB, AIDS, etc.
- Nuclear Power Plants
- Environmental Accidents
- Disposal and Handling of Wastes

- Ecological Terrorism
- Degradation on Non-renewable resources
- Hazardous Waste
- Scarcity of Resources
- Transboundary Pollution

Figure 17

Team Three outlined a wide-ranging group of policy options (Figure 18) which NATO could use to address these issues.

NATO POLICY OPTIONS

- NATO Develop Common Environmental Standards
- NATO task force to address acute environmental problems
- Make NATO military forces more environmentally sensitive
- NATO develop and share technology for environmentally sound military practices
- Use NATO satellites/communications infrastructure to monitor
  - Compliance with international environmental accords
  - Disasters
  - Deforestation
- NATO develop contingency plans to respond to environmental security problems
- Use NATO as a forum for information exchange and the creation of common positions

- NATO use its prestige to highlight environmental concerns
- NATO make its Good Offices available to resolve environmental disputes

Figure 18

Team Four

The former NATO team identified the following environmental issues (Figure 19).

ENVIRONMENTAL CHALLENGES

- Cross Border Transportation of Pollutants
  - Passage of air/water pollutants and uncontrolled export of hazardous toxic wastes
- Water Pollution
  - Trans National Pollution
- Water Scarcity
- Air Pollution
- Soil Contamination
- Solid and Nuclear Waste Disposal
- Soil Erosion
- Diminution of Bio-Diversity
- Pollution from Shipping
- Urban Sprawl

Figure 19

The team noted that in many parts of Eastern Europe lakes have been filled up to sixty percent with sediment that has run into it. To address the enumerated environmental

challenges, team four developed the following policies. (Figure 20)

NATO POLICY OPTIONS

- Pollution Prevention/Waste Minimization
- Pollution Control
  - Adherence to International Conventions
  - Harmonization of Standards and Limits
  - Economic Instruments
- Enhance and Exchange Knowledge
- Environmental Monitoring
- Environmental Management Systems

Figure 20

One participant noted that a key dimension to helping control environmental pollution is to enforce the concept of "the polluter pays." This approach will have the twofold benefit of discouraging polluters as well helping to generate funding which can be used to redress the problem.

Phase 3 - Prioritize Environmental Problems

The final component of the exercise was an opportunity for the group to prioritize amongst all the environmental problems that the four groups had identified. Using the GroupSystems V software suite, the participants were able to independently and anonymously identify their personal assessment of the top environmental issues facing NATO. The computer then aggregated the individual results and displayed the group's consensus ranking.

The environmental challenges identified by the four groups were first synthesized into twenty-two discrete environmental challenges. Each participant individually used a GroupSystems V software package to select the ten most significant environmental challenges. A **Yes** vote

indicated that the item was in the top ten; a **No** vote indicated that it was not. The twenty-two environmental challenges and the results of the votes on each are indicated below (Figure 21):

TOP TEN ENVIRONMENTAL PROBLEMS

Environmental Challenge	Yes %	No%
1. Fresh water scarcity and degradation	87.10	12.90
2. Prevent Nuclear Accidents	83.87	16.13
3. Climate change	82.76	17.24
4. Increasing population pressures -- migration	74.19	25.81
5. Nuclear waste disposal	72.41	27.59
6. Air pollution	62.96	37.04
7. Disposal and handling of Toxic & Hazardous wastes	61.29	38.71
8. Energy scarcity	60.00	40.00
9. Deforestation	57.14	42.86
10. Management of natural resources	53.57	46.43
11. Soil contamination	53.57	46.43
12. Natural disasters	52.00	48.00
13. Ecological terrorism	50.00	50.00
14. Diminution of bio--diversity	48.28	51.72
15. Uncontrolled export of Hazardous & Toxic Waste	46.15	53.85
16. Soil erosion	42.31	57.69
17. Agricultural runoff	40.74	59.26
18. Land mines	38.46	61.54
19. Industrial conversion (old to new tech)	28.57	71.43
20. Pollution from shipping	20.69	79.31
21. Emerging diseases -- e.g. TB, AIDS, etc.	19.23	80.77
22. Mega--cities (urban sprawl)	19.23	80.77

Figure 21

The participants were then asked to Rank Order the top nine consensus environmental challenges. Only nine were to be rank ordered because there was a tie at ten (Management of natural resources and Soil contamination), thereby resulting in an aggregate number of eleven. The results of the prioritization vote are show below. (Figure 22)

Rank Ordered Environmental Challenges

1. Prevent nuclear accidents
2. Fresh waster scarcity and degradation
3. Climate change
4. Energy scarcity
5. Increasing population pressures -- migration
6. Nuclear waste disposal
7. Air pollution
8. Deforestation
9. Disposal and handling of Toxic and Hazardous wastes

Figure 22

Game Evaluation

The participants agreed that the game had provided a unique opportunity to view environmental issues. By combining teams into heterogeneous groups and role playing, participants were able to gain new and useful perspectives. Additionally, these groupings provided the added benefit of developing new personal relationships with other practitioners in the field. Some players were frustrated by the rapid pace of the game and thought that a two day game would have provided more time for reflection and better analysis. In a similar vein, others were chagrined that the game had ended before all logical conclusions had been drawn. They would have preferred that there be some follow-on play to the morning's role playing sessions. However, there was no dissension concerning the region's environmental challenges nor suggestions that the NATO policy options identified in

Phase II were not of value in addressing environmental challenges that could become security problems.

It was noted that in the role playing segment of the game, all participants acted rationally, which might not always be the case in a real crisis. Additionally, there seemed to be no distinction between issues that could and could not be negotiated. Suggestion to enhance the value of future games included creating an environmental emergency and then having the gamers deal directly with a specific problem and develop solutions or recommendations appropriate to addressing it. Another approach might be to focus on how environmental issues could impact on Confidence Building Measures, although some work may have already been done in this arena. Any future games should be careful to eliminate any American bias in viewing environmental problems in Europe and should use actual organizational or geographical region constructs for teams, i.e., there is no organization or well defined geographical region called "Eastern Europe." Other teams that might be useful to be portrayed in a game include the European Union or perhaps the Black Sea or Nordic/Baltic teams.

The game planners were appreciative of all the comments. All participants were invited to provide additional suggestions on refining the game. Another game will be developed and conducted with the NATO Environmental Security Pilot Study members in the next eighteen to twenty-four months and will include multinational participants in its development. It was agreed that the game educated and enlightened the participants on the issues of environmental security, and enhanced the group's sensitivity to the varied international and interdisciplinary perspectives on the topic. The next game would build upon the lessons learned in this positive gaming experience and seek to explore additional new and creative approaches to addressing the issues of environmental security and preventive defense.

APPENDIX A

PARTICIPANTS

TEAM EASTERN EUROPE

Professor Andrejs Silins, Secretary General, Latvian Academy of Sciences, Latvia (Team Leader)

Dr. William T. Johnsen, Strategic Studies Institute, U.S. Army War College, USA (Facilitator)

Dr. Richard Ball, Physical Scientist, Office of Policy and International Affairs, USA

Lieutenant Colonel Boleshaw Adamczyk, Embassy of Poland, Poland

Ms Kerstin Imbusch, Ecologic, Germany

Mr. Lobomir Kusnir, Department of the Environment, Slovak Republic

Mr. Michael McNerney, Office of the Deputy Under Secretary of Defense (ES), USA

Mr. Jake Mentz, Pacific Northwest National Laboratory, USA

Mr. Lee Pasarew, Office of International Activities, Environmental Protection Agency, USA

Dr. A. Cemal Saydam, Middle East Technical University, Turkey

Lieutenant Colonel H.-J. Scholz, Ministry of Defense, Germany

Dr. Chris Tucker, Senior Scientific Advisor, Emergency Preparedness, Canada

Lieutenant Colonel Beverly Pointer, Center for Strategic Leadership, U.S. Army War College, USA (Recorder)

TEAM NATO

Dr. Corneliu Negulescu, Deputy Scientific Director, Research and Engineering Institute for the Environment, Romania (Team Leader)

Dr. Thomas-Durell Young, Strategic Studies Institute, U.S. Army War College, USA (Facilitator)

Mr. Anthony Downs, Director-General, Environment, Canada

Dr. Irene Freudenschuss-Reichl, Head, International Department/EU, Federal Ministry for the Environment, Youth and Family Affairs, Austria

Mr. Sergiu Galitchii. Director, Operative Informational System, State Ecological Inspection, Moldova

Mr. Nestor Gounaris, NATO CCMS Fellow**,** USA

Lieutenant Commander Fikret Hakguden, International Agreements Inspection Officer, Turkish General Staff, Turkey

Mr. Lawrence Koss, Head, Ships and Air Branch, Environment, Safety and Health, Office of the Chief of Naval Operations, USA

Mr. Kristof Kozak, CCMS National Coordinator, Hungary

Major Volker Quante, FAFORSE, Germany

Dr. Brian Shaw, Director, Center for Environmental Security, Pacific Northwest National Laboratory, USA

Professor Jurgis Staniskis, Director, Institute of Environmental Engineering, Kaunas University of Technology, Lituania

Mr. Reinhardt Streit, U.S. Army Corps of Engineers, USA

Colonel Andrzej Wlodarski, National Security Bureau, Poland

Colonel Barry Wingard, Center for Strategic Leadership, U.S. Army War College, USA (Recorder)

TEAM RUDYARD

Mr. Gazne Soysal, Executive Director, Center for Strategic Research, Ministry of Foreign Affairs, Turkey (Team Leader)

Dr. Craig Nation, Department of National Security and Strategy, U.S. Army War College, (Facilitator)

Mr. Gunnar Arbman, Director of Research, Swedish National Defence Research Establishment, Sweden

Mr. Jean Marie Guastavino, Attaché for Science and Technology (Environment), Embassy of France

Mr. Mikhail Pigoulevski, Chief Expert, Ministry of Natural Resources and Environmental Protection, Belarus

Mr. Antti Kivipelto, Ministry of Defence, Finland

Mr. Matthias Paustain, Research Assistant, Ecologic, Germany

Dr. Bert Spector, Director, Center for Negotiation Analysis, USA

Mr. Stanislaw Wilczkowiak, Deputy Director, Ministry of Environmental Protection, Resources and Forestry, Poland

Professor Michael Crutcher, Center for Strategic Leadership, U.S. Army War College, USA (Recorder)

TEAM SAPPHIRE

Mr. Csaba Kiss, Director, Environmental Security Centre, Ministry of Defence, Hungary (Team Leader)

Commander Thomas Anderson, Center for Strategic Leadership, U.S. Army War College, USA (Facilitator)

Mrs. Eva Affolter Svenonius, Department of International Affairs, Ministry of the Environment, Switzerland

Mr. Alexander Carius, Ecologic, Germany

Lieutenant Dr. Mesut Hakki Casin, International Agreements Inspection Officer, Turkish General Staff, Turkey

Ms Joanne Grossi, Senior Program Officer, Office of Population, U.S. Agency for International Development, USA

Mr. Petr Kozel, Regional Advisor, Ministry of Defense of the Czech Republic, Czech Republic

Professor Bedrich Moldan, Environmental Center, Charles University, Czech Republic

Mr. Risto Rautiainen, Senior Counselor, Ministry of Foreign Affairs, Finland

Mr. Brian Smith, Evidence Based research, Inc., USA

Dr. Stefan Summerer, Senior Advisor, Federal Agency for Environment, Germany

Professor Thomas Sweeney, Center for Strategic Leadership, U.S. Army War College, USA (Recorder)

TEAM WHITE

Mr. Marc Bernier, Department Head, ODCA/SAA, Embassy of France, France

Mr. Kurt Lietzmann, Federal Ministry of Environment, Nature Conservation and Nuclear Safety, Germany

Dr. Dexter Bryce, Senior Scientist, GEO-CENTERS, Inc., USA

Dr. Kent Butts, Professor of Political-Military Gaming, Center for Strategic Leadership, U.S. Army War College, USA

Rear Admiral Thomas Fox, Pacific Northwest National Laboratory, USA

Ms Laurie MacNamara, Senior Analyst, Evidence Based Research, Inc., USA

Ms Christa Matthew, Managing Editor, Environmental Change + Security Project Report, USA

Dr. Richard Matthew, Professor, School of Foreign Service, Georgetown University, USA

Mr. Scott Thayer, Special Assistant, Office of East European Assistance, U.S. Department of State, USA

Mr. Gary Vest, Principal Assistant, Deputy Under Secretary of Defense (Environmental Security), USA

APPENDIX B

AGENDA FOR ENVIRONMENTAL SECURITY GAME

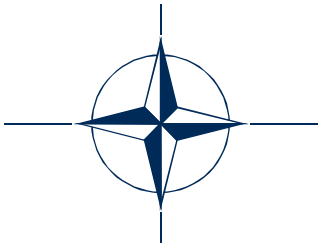
21 May 97 0800	Teams Arrive	Collins Hall	All Teams Participants
0800-0815	Administrative Anouncements Introduction	Main Conference Room	All Team Participants
0815-1000	Game Begins/Teams Develop Regional Interests and Policy Options	Main Conference Room/ Game Rooms	All Team Participants
1000-1015	Break	2nd Floor Collins Hall	All Participants
1015-1100 1015-1030 1030-1045 1045-1100	Negotiations Begin on Policy Options Rudyard/NATO EE/Saphire NATO/EE Rudyard/Saphire EE/Rudyard NATO/Saphire	Game Rooms	All Team Participants
1100-1130	Prepare Presentations on Policy Options	Game Rooms	All Team Participants
1130-1230	Team Briefings	Main Conference Room	All Team Participants
1230-1330	Lunch	Basement Collins Hall	All Participants
1330-1415	Teams Develop and Prioritize List of NATO Environmental Security Problems	Game Rooms	All Team Participants
1415-1445	Develop Policy Options	Game Rooms	All Team Participants
1445-1500	Break	2nd Floor Break Area	All Participants
1500-1600	Brief Prioritized List of Environmental Security Problems (With Supporting Rationale) and Policy Options	Main Conference Room	All Participants
1600-1630	GSV Introduction	Main Conference Room	All Team Participants
1630-1645	Break	2nd Floor Break Area	All Participants
1645-1715	Prioritize Environmental Problems Using GSV	Main Conference Room	All Team Participants
1715-1730	Discussion and Review of Results by Mr. Vest	Main Conference Room	All Participants

APPENDIX C

ENVIRONMENTAL SECURITY GAME OVERVIEW

Environmental Security Game

United States Army War College
Center for Strategic Leadership
May 21, 1997



Objectives

- **Broaden perspectives of participants**
- **Increase sensitivity to regional interests**
- **Identify regional environmental security challenges**
- **Broad, proactive approach to environmental security policy**
- **Maximize participant contributions to environmental priorities / policies**

Game

- Game Book
- Scenario
- Map
- Video
- Focus: Prevention / Creative Use

Methodology

- Inform / Share
- Creative / critical thinking
- Identify Country / Regional Interests
- Identify and Prioritize Challenges
- Develop Viable NATO Policy Options (Bilateral / Multilateral / Unilateral)
- Educate

Game Phases

- Morinig: Role Playing
- Afternoon: Non-Role Playing

Country: Interests

Strong Economy

- Survial or Country
- Health and Welfare of People
- Interest 4
- Interest 5
- Interest 6

Interests and Environmental Dimensions

Strong Economy

- Health and Safety of Workers
- Environment Constraints on Production
- Interest 2
- Interest 3

Policy Recommendations to NATO

- Recommendation 1
- Recommendation 2
- Recommendation 3
- Recommendation4
- Recommendation 5

Game Phases

- Morning: Role Playing
- Afternoon: Non-Role Playing

Environmental Challenges

- Water Quality Danube Basin
- Downstream impacts on health and ecomony due to industrial pollutants in the Danube Basin.
- Challenge 2 (short title, 50 characters max.)
- Description challenge 2

Administrative

- NON-ATTRIBUTION
- Game Room: Cameras and microphones not recording
- UNCLASIFIED format
- Open exchange: share experience / ideas
- Respect and encourage other opinions
- Game Books must be returned
- Time limits demand utmost cooperation
- No food or drink in main conference room or game rooms

APPENDIX D

Game Scenario

Background

Following its liberation in early 1945, the People's Democratic Republic of Saphire was formed and immediately came under the influence of the Collective Party of Saphire (CPS). As an original member of the Eastern Alliance, Saphire hosted a small number of Alliance forces serving as a bulwark on the southwestern frontier of the organization. It was dotted with numerous listening posts and air defense installations until the dissolution of the Alliance a few years ago. During the period of Collective rule, a number of medium and heavy industries were introduced into the country, which previously had been dominated by agriculture. These industries included steel, food processing, textiles, and chemicals. Following the fall of the Berlin Wall, Saphire underwent a relatively peaceful political revolution as it transitioned under a caretaker government to a multiparty parliamentary democracy. The new constitution of the Federal Republic of Saphire came into effect in March 1992, and the first free elections were held in September of that year.

The first freely elected government was controlled by a plurality of delegates from the Collective Party of Saphire (CPS), who ruled in coalition with several slowly developing centrist parties. The initial coalition has faltered and the centrist parties have begun to seriously challenge the CPS in subsequent parliamentary elections. Also, several fringe and ethnic parties have begun to make their presence felt in some of the local government elections. Some of the new government's early actions were to begin to privatize local

industry, introduce basic financial and commercial institutions, and develop some basic land reforms. As with many of the former Eastern Pact states, the years of centralized economic planning had allowed inefficient firms and obsolete plants to continue operating long after they needed to be replaced for economic, environmental, and occupational safety reasons. The opening of local markets to competition initially proved disastrous for domestic firms and industrial production has contracted for several years, though the rate of contraction has slowed substantially in the past 2 years.

One relatively bright spot in the industrial sector has been in the production and export of EMBS (Ethyl-Methyl Biostimulent). Originally developed in the late 1950s as a family of isomeric plant hormones in the United States by Phytofun Corp, EMBSs did not go into full production because of early concerns over the persistence of these compounds in the environment. Limited production of EMBSs for export continued in the United States for a few years, though licensed international production continued for some years after Phytofun converted its U.S. facilities to other uses. Nonetheless, Phytofun did secure a patent for EMBSs in the hopes of being able to improve them through further research and development. The U.S. Government conducted two large-scale experiments with EMBSs during the Vietnam conflict. The first was an attempt to enhance the crop load per acre of specific strains of rice. This initially had limited success, but later met with diminishing returns, attributed at the time to the inexperience of local villagers in applying chemical fertilizers. The second application used a slightly modified variant of the EMBS as a defoliant. However, it was found to be too slow for military use and was eventually replaced by the "Herbicide Orange" family of defoliants. The patents on EMBS expired in the late 1960s and early 1970s and the effort was viewed as a commercial failure on the part of Phytofun.

Following the expiration of the Phytofun patents, the Ministry of Agriculture, the Ministry of Light Industry, and the Saphirian Academy of Sciences began to develop a

family of chemical foliage enhancers and retardents based on EMBS isomers. Initial trials and limited domestic use of the new variants were very encouraging and production began in earnest. These agents were produced with an EMBS isomer utilizing a vanadium-based complexing chelate. Large shipments were sent to several neighboring countries during the late 1980s. Again, initial successes were recorded, but continued use brought diminishing returns. The failure of the EMBSs was accorded to irregular application under poor weather conditions. Despite this setback, Saphire continued to produce and export EMBSs to a number of developing nations in Asia and Africa under the brand name of Spectorcide.

Currently, EMBS production represents a sizable portion of Saphirian exports, accounting for 7-12% of export revenues. Ownership is mixed between private firms and partnerships and between private concerns and public institutions. Saphire has been under increasing pressure from private and international banks to develop a more stable and export-based economy, and to reduce imports and government expenditures. Domestic use of the foliage enhancers has increased in recent years, as the nation has striven to be self-sustaining in food stuffs and has publicly stated its goal to be a net food exporter by the end of the century.

However, a recent soil survey in Saphire revealed a high level of EMBS buildup in areas of repeated agricultural application. This is especially true in the northern provinces of the country, notably Choteau, which are still the primary agricultural areas, producing wheat and beef. The last five quarters have registered net decreases in production from these areas and some areas have fallen out of cultivation entirely. Local governments claim that the slow pace of land reforms initiated by the federal government and inadequate legislation covering the financing of local infrastructure and communal credit banks are to blame for the reduced productivity and quality. Additionally, as crop quality has declined, grain intended for consumer markets has been used for livestock feed.

A World Health Organization study in Saphire concluded that an upswing in infant mortality and birth defects and a decline in life expectancy are due in large part to the long-term consumption of foods contaminated with EMBS and heavy metals, especially vanadium. The study also cites a lack of modern safety equipment and the absence of sufficient evacuation planning for localities downstream and downwind from a number of EMBS plants. Federal government officials claim that the report overstates the dangers, which they say are inherent to the chemical industry, and that every reasonable precaution has been taken to ensure the health of the populace.

Reports in the more industrialized central part of the country, near the capital of Kalispell, have noted a more precipitous decline in agricultural production than in the north and a slight, but notable increase in the infant mortality rate and the rate of birth defects. Tests of local aquifers have noted a sharp increase in the level of EMBSs and vanadium in the capital's water supply. According to local accounts, dead zones around industrial areas have increased. Local government officials have called on the federal government for tighter emissions and safety standards for the EMBS plants, but a lack of consistent funding, corrupt federal regulatory bodies, and a desire to protect the profitable niche market for EMBS have contributed to inaction on the part of the federal government.

The decline in agricultural production and the decline of the few local industries have created a sense of distrust of and a belief in the ineptitude of the federal government among regional and local governments. This is especially true in the north where there is a general sense of dissatisfaction with the pace and depth of economic and political reform. Peaceful, but noisy, demonstrations have been growing increasingly frequent outside of federal government buildings, though local governments have not been spared the ire of the populace either.

The SPS and several of the major centrist parties in the coalition government are dominated by ethnic Saphirians.

However, many of the local governments, especially those in the culturally separate north, are controlled by smaller Ronanian, Broadusian, or Sumatran ethnic parties. Regional and local governments in central Saphire are largely Saphirian, while those in the southern areas are mixed between Saphirian, Missoulian, and Glentanian communities.

Random tests of meat shipments from Saphire to the neighboring states of Broadus, Sumatra, and Ronan have revealed unacceptable levels of EMBS residues. These residues were accompanied with trace quantities of heavy metals, especially vanadium, which had not previously been associated with EMBS. Saphirian agricultural products, notably specialty meat products, are available in several of its neighboring countries and in Germany, Belgium, Italy, and the United Kingdom. Broadus and Sumatra have been experiencing unusual systematic fish kills directly down stream from dredging operations in the Wise River. These dredging operations, which are for the development of new inland piers and port facilities, disturbed recent thick layers of sediments deposited during the floods of 1987. The fish kills occurred within 5 days of the dredging operations. Bottom-dwelling species such as catfish were the most affected. Tissue analyses of the fish revealed toxic levels of non-dissolved EMBS and vanadium. The electronic monitoring system put in place by the Saphirian federal government did not detect the presence of EMBS or vanadium in sufficient quantities in the Kootenai or Gallatin Rivers, which flow into the Wise River. The system put into place in late 1994 is managed by parties who have been connected to several public/private EMBS joint ventures. Additionally, the Kootenai River flows through the former Shelby Military Reservation, which has recently been turned over to local interests as a tax-deferred economic development zone. The site had been a storage area for several toxic substances, including rocket and jet fuels, and was the site for production of a military variant of EMBS. The military invested considerable time and money into the cleanup of its former military bases and the federal

government had certified Shelby as being de-contaminated and suitable for development in early 1996.

Shellfish in the Ruby Bay in the Como Sea have also tested positive for toxic levels of non-dissolved EMBS and vanadium, and their consumption has been banned by local authorities. Water treatment plant effluent quality tests of the Bitteroot River in Glentana, which flows from Saphire, have revealed unusually high levels of undissolved EMBS. While EMBS is not used extensively for agriculture in the southern part of the country, several of the original production facilities are located in the valley carved by the Bitteroot in the Saphirian province of Lower Alhambra. Glentana has launched several official protests with the government of Saphire and both states have recalled their ambassadors on several occasions. This issue is just one of several points of contention between Glentana and Saphire, including border demarcation disputes, border controls and the preservation of rights of their respective ethnic minorities. Glentanian military aircraft have reported being illuminated by Saphirian air defense radar in Glentanian airspace, while Saphirian authorities claim that Glentana supports ethnic separatist movements in Lower Alhambra.

Actions

Governments within the region individually begin to embargo food stuffs, notably meats and grains from Saphire, pending testing for EMBS and heavy metals. The slow process of inspection and the lack of sufficiently refrigerated storage areas for goods awaiting inspections cause large amounts of product to be lost in transit. Reports of smuggling goods across the Wise River and the capture of several Saphirian citizens engaged in smuggling gives impetus for the Broadusian, Ronanian, and Sumatran governments to deploy troops, patrol boats, and aircraft in support of customs and law enforcement officials to enforce the embargo. Some European governments, including Italy, Germany and France hold Saphirian agricultural goods for inspection. Several European NGOs push for a

ban on Saphirian agricultural goods pending the cessation of local use of EMBS, and several international NGOs, including Greenpeace, are making plans to push for a global ban on the use and production of EMBSs. Agriculture and EMBS production witness large immediate declines and the limited economic safety net put in place by the federal government fails to stabilize the situation for many Saphirians, especially those in the north. Growing demonstrations call for the ouster of the current prime minister and her government, but no single party is able to mount a successful coalition. The president, Josephus Carcione, a member of the Saphirian Nationalist Democratic Front, one of the growing centrist parties, moves to dissolve parliament, and sets the date for the next parliamentary elections. However, this does not satisfy the growing and restless farmers and agricultural laborers in the north. Ethnic extremists seek to incite latent distrust for the Saphirian-dominated federal government and several demonstrations turn into riots with demonstrators hurling rocks and bottles at police, who respond with riot gear, tear gas, and water cannons. Extremists claim that the federal government has never had any intention of regulating the EMBS plants and was trying to drive out the ethnic minorities from the valuable lands along the Wise River, even if it meant resorting to wholesale chemical genocide.

The riots begin to subside after a couple of days, but tensions still run high. Local politicians continue to heavily criticize the federal government and its inability to protect its citizens at the hands of those who profit by the production and sale of EMBS. On May 18, word spreads of a serious leak of an aerosol variant from a storage facility at one of the EMBS plants near the northern city of Kiowa. Though the story of the leak is not confirmed, panic ensues as large numbers of people either flee or take to the streets of several cities throughout the north. The local police are overwhelmed by the size and intensity of the riots. The army, which is predominantly ethnic Saphirian conscripts, but has several units dominated by ethnic groups from the

north, is called in to restore order. Rioters attack several lightly defended arms depots and are unopposed by mutinous troops recruited from the local area. As loyalist troops are deployed, they find themselves confronted by rioters armed with automatic rifles, RPG-7s, machine guns, and some light armored vehicles. Loyalist troops are unable to take control of the northern cities and they remain in the hands of the rioters. Some scattered fighting ensues. Reports start coming in from border control points along the Sumatran and Ronanian frontiers of large movements of people fleeing the area of Kiowa and the larger cities of the northern provinces. The refugees were initially turned back, lacking the necessary travel documents, but at some points the refugees pushed their way past the immigration officials. Sumatra and Ronan have both sought to reinforce their borders and have publicly stated that those trying to cross their borders without proper papers would be forcibly removed or imprisoned.

Chemical Contaminant Background Paper

EMBS History.

In the late 1950's a family of isomeric plant hormones called EMBS (Ethyl-Methyl Biostimulents) was synthesized in the US by the Phytofun Corp. The EMBSs were capable of acting as either foliage enhancers or defoliants depending on their specific chemical structure and method of application. They were originally developed in hopes of producing specific effects in agricultural crops. Initial experimental plot tests did indicate some promise for controlling leaf development. It was thought that this in turn might lead to enhanced stem growth and improved fruit or grain loading in various crops. However the EMBS promise was short lived.

Pytofun did not pursue full scale production of these compounds due to early indications that they were very persistent in the environment. Buildup in transport pathways was anticipated and other potential bioactivity was unknown. The largest disappointment however was

the fact that the EMBS were later found to be rather counterproductive for their intended use. After initial applications, larger and larger doses were required to produce the same effects in plants grown in previously treated experimental plots. It became apparent that continued applications degraded soil quality and crop capacity. Nonetheless, Pytofun did secure a patent for EMBSs in hopes of improving them through further R&D.

Two larger-scale application of newer EMBSs occurred early in the Vietnam conflict. They were applied to restricted areas of rice crops in an effort to enhance the crop load per acre. This attempt failed. The second application attempted to use them as early variety defoliants. However it was found to be too slow acting to be of military value. EMBS was quickly replaced by a family of agents known as “Herbicide Orange” for defoliant purpose. The patents on EMBS expired in the late 1960's and early 1970's without its ever having been produced commercially.

Recent Developments.

Rumors of a new, agricultural enhancement product were common during the 1980's, particularly after the disastrous wheat shortages. The new Federal Republic of Saphire (Saphire) revealed that the former People's Democratic Republic of Saphire had successfully developed a series of chemical foliage enhancers and retardants. These were isomers of the EMBS that had been unsuccessfully tested in US agricultural experiments. These agricultural products were primarily produced in Saphire’s rich agricultural belt. For a short period of time crop yields did appear to rise, especially large leafy produce which realized detectable gains in production throughout the 1980's.

However, a recent soil survey in Saphire revealed a high level of EMBS buildup in areas of repeated agricultural application. In fact, these areas have generally fallen out of cultivation. The local governments are claiming that the generally poor economy is to blame for the decreased

acreage under cultivation. However, rumors persist that the cause is that crop yields in the region have dropped sharply and are now below the point of practical harvest economics.

Recent investigations of several chemical plants in the region have indicated that an EMBS isomer utilizing a vanadium--based complexing chelate was produced in quantity. It was freely applied to wheat and corn in the region and somewhat more sparingly to small leafy produce. Similar to the US experience, there was some initial success, but as crop quality dropped off, the region's corn crop has been used as livestock feed rather than for direct consumer consumption.

Recent random testing of meat shipments from Saphire to Broadus and Ronan revealed an unacceptable level of EMBS residues. These residues were accompanied with trace quantities of heavy metals, especially vanadium, which had not previously been associated with EMBS. Broadus has been experiencing unusual systematic fish kills directly down stream from dredging operations in the Wise River. These dredging efforts, which are for the development of new piers and port facilities, disturbed recent thick layers of sediments deposited during the floods of 1987. The fish kills occurred within 5 days of the dredging operations. Bottom-dwelling species such as catfish were the most affected. Tissue analyses of the fish revealed toxic levels of non--dissolved EMBS and vanadium.

Finally, atmospheric monitors have begun to detect trace levels of vanadium-complexed organic aerosols. These atmospheric findings correlate well with concurrent findings of these particulates on corn and wheat. The general location of the contaminated produce is in areas where Wise River water is used for irrigation.

Broadus has been attempting to develop a commercial waterfront along the Wise River. However the massive fish kills have caused the World Bank to place funding for the project on hold pending resolution of the river contamination issue. The lack of funding has led to unrest

in the waterfront labor community. In addition, the major transshipment point for Broadus's grains was to be this new port facility. If the river front development does not proceed, Broadus will probably opt to develop rail lines and a surface transportation infrastructures as an alternative. This would be more costly and would take many years to complete.

Ronan is struggling with a large transient population and migrant worker communities. There are no resources to treat general health within these communities and recent, recurring outbreaks of “weakness disease” has been straining the resources of the region creating critical shortages and significant unrest in rural communities.

Pharmacology, Health Effects, and Environmental Impacts

Initially, the human health effects of EMBS were not extensively researched as production of the chemical was very restricted. As a result of the Vietnam experience with Herbicide Orange, EMBS was reviewed by the US FDA and several important health effects and bioavailability findings were reported:

- EMBS is not completely soluble in aqueous systems and it tends to accumulate in intercrystalline layers of clay minerals. The presence of thixotropic clays exacerbates this accumulation, although no release studies were pursued. It is postulated that in the presence of agitation, the weak, interlayer clay bonds are broken and EMBS is released into suspension.

- Above a certain dose, EMBS were found to have mild neurotoxic properties in fish and mammals, reminiscent of, but less pronounced than the effects of saxitoxin and related red tide toxins. At higher doses decreased nerve function was followed by impaired striated muscle response. Massive oral doses precipitated respiratory failure and death

from asphyxiation. MLD for EMBS in humans was not established, but in test animals body weight and age were key variables. Young animals were the most susceptible.

- EMBS-vanadium complexes tend to attach to bone, causing a form of osteoporosis. The bone-EMBS-vanadium matrix formed very rapidly when test animals were exposed to dermal patches. The osteoporosis was found to be irreversible and pervasive in test animals.

- Since EMBS has a high potential to bioaccumulate rapidly, the ingestion of contaminated feed is of great concern. Fish absorb EMBS directly from suspended clay. Direct absorption through both scales and gills is postulated as the most likely mechanisms since residues accumulate rapidly in skin, muscle and gills.

Source Terms.

All of these events point to two source terms for the recent cross--border distribution of EMBS in the environment. The first source term is evidently the agricultural application of the EMBS variant, the second source term is the chemical process itself.

Event	Agricultural Source Term	Chemical Process Source Term
Residues in meat	Use of EMBS treated feedback	
Fish kills in the Wise River		Significant leakage and pollution from the Production of EMBS
Atmospheric Detection	Exposure of treated soil to Strong wind transport	Emissions from the chemical process
Reduction of crop yield	Over treatment with EMBS and buildup in soil	