Pilot Study Report
NATO Security Context 1

Key Findings

- *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 organisations to respond to non-traditional security concerns including the environment.*

- *The North Atlantic Treaty recognised from its beginning that security is not entirely a function of military power or geopolitical strength. It recognises 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 defence dimension of security and recognises 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 defence. 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 purposes of consultation with the other Member States when a 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 organisations 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 environmental, development and foreign and security policy.*

1.1 Introduction

At the threshold of the 21st Century, societies are facing environmental challenges. As the number of environmental problems and their influence on natural processes increase, their impact on the potential incidence or escalation of conflict and security, is becoming more of a concern. This is especially the case in particular regions experiencing significant environmental stress (see Chapter 2 for the definition of this term). At the same time, other non-traditional threats to security such as economic decline; social and political instability; ethnic rivalries and territorial disputes; international terrorism, money laundering and drug trafficking; and environmental stress are redefining the traditional missions of security organisations such as the North Atlantic Treaty Organisation (NATO).

NATO, along with other security organisations, has begun to address non-traditional threats to security in order to meet the looming domestic and international risks defining the security context in the post-Cold War world. Although nations continue to be the central actors in international politics, they increasingly participate in a multitude of international regimes and institutions. This trend in international politics has shifted more responsibility and capability to institutions and regimes to co-ordinate and co-operate in responding to future challenges.

While deterrence and defence against military threats are a basic responsibility of any nation or security alliance, other areas such as the environment are also perceived and defined as critical national interests. Although the effectiveness of international regimes is limited by national sovereignty, nation states are increasingly relying on global and regional institutional frameworks. Institutions and organisations provide both formal and informal networks that generate the means and incentives for effective co-operation among states, including confidence and capacity building mechanisms (see Chapter 6 - Policy Responses).

To address the capability of NATO to respond to non-traditional security threats, including the challenges brought on by the consequences of environmental stress, this chapter first examines briefly the history of NATO and the underlying assumptions, principles, and key articles of the North Atlantic Treaty. This is followed by a look at the Committee on Challenges to Modern Society (CCMS) which is a forum for addressing research focused on the environment within the NATO framework. The chapter then reviews some of the changes to the Alliance that have developed in response to the post-Cold War security context, including the seminal Strategic Concept of 1991 and new structures such as the Euro-Atlantic Partnership Council (EAPC) and the Combined Joint Task Force (CJTF).

1.2 Overview of the North Atlantic Alliance

The North Atlantic Treaty was signed on 4 April 1949 in Washington as a direct response to the perceived threat of Soviet aggression in Eastern Europe. National security was predicated upon preserving the territorial integrity and sovereignty guaranteed to states under the Charter of the United Nations. However, European security was of concern for states in Western Europe and North America and no state could hope to guarantee its own security without the assistance of the others. The purpose of the Alliance was to present a united and co-ordinated defence to deter any aggressor which might threaten one or several Member States. The parties to the Treaty sought increased security through collective and individual means and through regular and frank consultations with their allies.

NATO is a political and military alliance with a collective defence as its main principle. According to Article 5,

> The Parties agree that an armed attack against one or more of them in Europe or North America shall be considered an attack against them all; and consequently they agree that, if such an armed attack occurs, each of them, in exercise of the right of individual or collective self-defence recognised by Article 51 of the Charter of the United Nations, will assist the Party or Parties so attacked by taking forthwith, individually and in concert with other Parties, such action as it deems necessary, including the use of armed force, to restore and maintain the security of the North Atlantic area.

The second focus of the North Atlantic Treaty is to aid the resolution of any disputes involving the Member States through peaceful means. In accordance with the Charter of the United Nations, disputes should be settled by peaceful means which do not endanger international peace, security and justice. Furthermore, no threat or use of force which is inconsistent with the purposes of the United Nations (UN) should be applied (see Article 1, North Atlantic Treaty 1949). Member States are obliged to refrain from entering any international engagements or treaties which could conflict with the provisions of the NATO Treaty.

The Allies, though pledged to co-operative and collective action, do not forfeit any of the rights guaranteed to them under the Charter of the United Nations. As an organisation of equal states, the North Atlantic Alliance recognises the primacy of the state and its sovereignty. Member States are free to enter into treaties and compacts they deem to be in their national interest with only their pledge that these agreements do not conflict with the basic principles of the North Atlantic Treaty. NATO does not hold a statutory veto over the affairs of the Member States.

Adherence to these provisions is facilitated by frequent consultations among Member States. According to Article 4 of the Treaty:

> The Parties will consult together whenever, in the opinion of any of them, the territorial integrity, political independence or security of any of the Parties is threatened.

The main consultative body of the Alliance is the North Atlantic Council (NAC), which meets at least weekly at the Permanent Representative level at NATO Headquarters in Brussels. Meetings of the NAC are also held at the level of Foreign Minister, Defence Minister and the Head of State and Government level, each level having the same degree of authority. All Member States are represented on the Council. The actions taken by the Council have the strength of policy for the Alliance as a whole. The Council has also delegated some of its authority to a number of committees and sub-committees, amongst them a Defence Planning Committee (see Article 9, North Atlantic Treaty 1949).

The North Atlantic Treaty recognises that security is not entirely a function of military power or geopolitical strength. NATO would need to include an economic, and to a lesser extent, a social dimension to its conception of security. Faced with a numerically superior threat in the East, NATO would have to rely upon more capital intensive strategies in its military confrontations. This required Member States who were economically strong and resilient. Article 2 states:

> The Parties will contribute toward the further development of peaceful and friendly international relations by strengthening their free institutions, by bringing about a better understanding of the principles upon which these institutions are founded, and by promoting conditions of stability and well-being. They will seek to eliminate conflict in their international economic policies and will encourage economic collaboration between any or all of them.

1.3 Civil Dimension - CCMS

Since its foundation, the Alliance has incorporated a civil dimension in addition to its collective defence and consultative aspects. Article 2 provides that member countries will contribute to the further development of peaceful and friendly international relations by promoting conditions of stability and well-being. Thus, from the beginning, Article 2 incorporated a more comprehensive concept of security by highlighting stability and well-being as underlying factors of security. As a consequence, economic and social, thus civil, instruments which strengthen stability and well-being can be seen as appropriate means of furthering international security.

NATO established the *Committee on the Challenges of Modern Society* (CCMS) in 1969 in order to give this civil dimension of security an institutional framework through co-operation on civilian research. The Alliance enhances this dimension through voluntary co-operation in civil research projects. The practical work of CCMS is largely focused on environmental problems and their consequences for societies.

Since its foundation, the CCMS has provided a forum for Allied co-operation on issues related to trans-boundary environmental protection and environmental problems in general. CCMS strengthens the non-military

co-operation among the Allies (to later include Partner countries) through co-operative research projects sponsored by one or more Members and addressing the general quality of life in modern society. In its early days, CCMS was one of the few international institutions dealing with environmental issues.

In the framework of CCMS, Member States conduct pilot studies and projects on various environmental topics. CCMS has published more than eighty studies 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. Since 1992, projects on defence-related environmental issues have received a special emphasis (e.g.: conversion and clean-up of former military sites). CCMS further enhances civil co-operation among Member States and Partner countries through CCMS Fellowships and Study Visits in the framework of the pilot studies' research agendas.

The role of CCMS received a new meaning after the dissolution of the Warsaw Pact. On the occasion of NATO's 40th Anniversary in 1989, Member States promoted a further strengthening of the civil dimension of the Alliance and thus an additional strengthening of CCMS. It became an important institution for enhancing co-operation between NATO and Co-operation Partners and in particular to address subjects of interest to the countries of Central and Eastern Europe. The creation of the Euro-Atlantic Partnership Council (EAPC) in May 1997, which replaced the North Atlantic Co-operation Council (NACC), provides an enhanced framework for political consultations between the Alliance and the Partner Countries and for the preparation and co-ordination of Partnership for Peace (PfP) activities. Member States of the EAPC can participate in pilot studies, propose topics and act as pilot study co-chairs, as could members of the NACC since 1992.

1.4 NATO and the New Security Context

With the dissolution of the Warsaw Pact and the disintegration of the Soviet Union, NATO reassessed its raison d'être to adapt to a new, dynamic and complex security context. The end of the Cold War was accompanied by significant changes in the global security context, as well as to the European scenario. The removal of the constraints associated with bi-polar competition increased the complexity of the international system, introducing changes at a much faster pace than had been the case in the post-war era. In response, NATO's Heads of State and Government agreed in London in July 1990 on the need to transform the Atlantic Alliance to reflect these new changes while reaffirming the basic principles on which the Alliance had been founded.

1.4.1 The Strategic Concept of 1991

Member States accepted a new Strategic Concept at the meeting of the North Atlantic Council Heads of State and Government in Rome in November 1991. The Strategic Concept recognises the changed security environment while reinforcing the basic principles of the Alliance. It looks to threats from non-traditional sources and addresses Alliance security in an expanded regional and global context. These concerns are addressed in paragraphs 7, 8, and 9 in the Strategic Concept of 1991.

Paragraph 7

The security challenges and risks which NATO faces are different in nature from what they were in the past. The threat of a simultaneous, full-scale attack on all of NATO's European fronts has effectively been removed and thus no longer provides the focus for Allied strategy. Particularly in Central Europe, the risk of a surprise attack has been substantially reduced, and minimum Allied warning time has increased accordingly.

Paragraph 8

In contrast with the predominant threat of the past, the risks to Allied security that remain are multi-faceted in nature and multi-directional, which makes them hard to predict and assess. NATO must be capable of responding to such risks if stability in Europe and the security of Alliance members are to be preserved. These risks can arise in various ways.

Paragraph 9

> Risks to Allied security are less likely to result from calculated aggression against the territory of the Allies, but rather from the adverse consequences of instabilities that may arise from the serious economic, social and political difficulties, including ethnic rivalries and territorial disputes, which are faced by many countries in Central and Eastern Europe. The tensions which may result, as long as they remain limited, should not directly threaten the security and territorial integrity of members of the Alliance. They could, however, lead to crises inimical to European stability and even to armed conflicts, which could involve outside powers or spill over into NATO countries, having a direct effect on the security of the Alliance.

Even if these instabilities are not regarded as directly threatening the security or territory of a Member State, they are regarded as enhancing the potential incidence or escalation of conflict, which could involve outside powers or spill over into NATO countries.

The Strategic Concept emphasises the impact of events in areas previously considered to be of reduced importance vis-à-vis the Warsaw Pact. The Strategic Concept refers to the need to "maintain peaceful and non-adversarial relations with the countries in the Southern Mediterranean and Middle East." It also expressed Alliance concerns over some functional areas, notably the proliferation of weapons of mass destruction and terrorism, which may be addressed by NATO according to Article 4 of the Treaty.

While it was important to recognise the changing security context and to broaden the geographic and functional areas of concern, the Strategic Concept addressed and recast the two principal focuses of the Alliance - collective security and regular consultation amongst its Member States. The emphasis on the defence dimension of security is complemented by a new, broader approach to security. As stated in paragraph 24:

> ...but what is new is that, with the radical changes in the security situation, the opportunities for achieving Alliance objectives through political means are greater than ever before. It is now possible to draw all the consequences from the fact that security and stability have political, economic, social, and environmental elements as well as the indispensable defence dimension. Managing the diversity of challenges facing the Alliance requires a broad approach to security. This is reflected in three mutually reinforcing elements of Allied security policy; dialogue, co-operation, and the maintenance of a collective defence capability.

The importance of regular consultation amongst the Member States is expanded, with the character and importance of early consultation emphasised through dialogue and co-operation with all other European states. In order to prevent crisis and to manage crises which arise, the members intend to develop a pattern of institutionalised bilateral and multilateral co-operation, which could comprise all relevant fields of security. At the same time, this new partnership between the Alliance and other European states to be considered as an essential factor in overcoming past divisions and preserving security in Europe, which today is regarded as indivisible.

Furthermore, this new security context in Europe emphasises prompt responses to crisis. The Strategic Concept supports a coherent approach towards crisis management, with special emphasis on the choice and co-ordination of appropriate measures for crisis management from the political and military sector.

The Strategic Concept also addresses the role of the Alliance's military forces in the new security context, including realigning their force structure and posture. The role of the military is to:

> ...complement and reinforce political actions within a broad approach to security, and thereby contribute to the management of such crises and their peaceful resolution. This requires that these forces have a capability for measured and timely responses in such circumstances; the capability to deter action against any Ally and, in the event that aggression takes place, to respond to and repel it as well as to re-establish the territorial integrity of Member States (see paragraph 43).

1.4.2 Relationships With Other Actors

The NACC, and later, the EAPC, provides a forum for the NATO allies to engage in regular dialogue and co-operation with the former members of the Warsaw Pact, the New Independent States (NIS) of the former Soviet Union as well as with the neutral or non-aligned states in Europe. The Partnership for Peace allows states to co-operate on a more direct basis and has provided an avenue for interacting with those states that are not members of NATO or EAPC.

As a reaction to the new security context, NATO has moved toward closer co-operation with the Western European Union (WEU), the Organisation for Security and Co-operation in Europe (OSCE), and the United Nations (UN). The development of an European Security and Defence Identity and the building of a European pillar within NATO was supported by Alliance members in co-operation with the European Union (EU) and participation of all the Allies. This demonstrates the Alliance's acceptance of the process of European integration.

NATO involvement in the restoration of peace in Bosnia signalled a significant change in NATO's role in European security. Aside from being the Alliance's first operational deployment of combat forces, it was NATO's first deployment beyond the boundaries of the Alliance and the first time that NATO forces operated under the jurisdiction of the United Nations Security Council in a peacekeeping role. The NATO-led Implementation Force (IFOR) included 16 non-NATO countries from Europe, North Africa, the Middle East and Asia, demonstrating the Alliance's ability to co-ordinate and engage diverse coalitions in the cause of peace. As the Alliance prepares to enlarge, its ability to remain flexible and responsive to changing security conditions will guarantee it an important role in the new security context.

The increasing influence of institutions and regimes can be found in the field of environmental policy as well as security policy. The fundamental changes in the post-Cold War period require corresponding adaptations to international institutions.

1.5 Future Challenges

In a world of growing economic and political integration and interdependence, environmental stress and political instability are of concern to regional organisations. Member States can be affected by global environmental stresses such as climate change or ozone depletion and their socio-economic effects. NATO recognises the importance of socio-economic stability and growth to the preservation of international peace. This suggests that international peace and stability are likely to be threatened by the unfavourable consequences of local, regional, and global environmental stress.

These new challenges differ from the old ones in their expanded geographical reach. The consequences of environmental stress for security are spread world-wide. The most serious impact of environmental stress is 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, such as the environment, is a high policy priority for a number of states.

These new challenges also differ in their sectoral reach, as they comprise environmental as well as socio-economic and political factors. They will require new instruments to meet them in the future. However, NATO still reaches its highest level of integration in the area of military co-operation. It is through its military capacities and cohesion based on military integration [NAC, integrated command and control structures, Combined Joint Task Forces (CJTF)] that provide NATO with the ability to accomplish its political function.

The Strategic Concept responds to this challenge in its broad definition of security which explicitly cites the environment as one of the dimensions of security which the Alliance must address in the changing European security context. With reference to Article 4, any issue can be brought before the Alliance for the purposes of consultation with the other Member States when a 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.

1.6 Capacities of the Alliance to Face the New Challenges

Regular consultations between Member States provide the opportunity to resolve difficult issues at the lowest level possible, thus leaving only the most politically contentious to rise to the attention of the North Atlantic Council. 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. Potential areas for consultation or co-operative mechanisms which are aimed at reducing tensions among concerned parties over environmental issues most notably include the development and co-ordination of data sharing and exchange arrangements for regional monitoring networks.

The need to manage environmental stress and its consequences for security has been acknowledged by the principal European security organisations, including the OSCE, WEU, and NATO. Since the Charter for a new Europe in 1990, the OSCE has been progressively integrating environment into its security concept and policy. The Lisbon Declaration of December 1996 states that "the OSCE should focus on identifying the risks to security arising from economic, social and environmental problems, discussing their causes and potential consequences, and draw the attention of relevant institutions to the need to take appropriate measures to alleviate the difficulties stemming from those risks". In November 1997, the OSCE decided to create a "Mandate for a co-ordinator of OSCE economic and environmental activities", whose priority will be to develop co-operative schemes with other relevant international institutions toward evaluating and dealing with environmental risks to security. At its extraordinary meeting of November 1995, the WEU Council of Ministers adopted a text called "European Security: A Common Concept of the 27 WEU Countries", which states that "the potential impact of large-scale environmental damage on human health, economic activities and the eco-system could affect well-being and stability in sub-regions or larger parts of Europe, and thus stability and security in Europe as a whole."

As NATO looks to more areas to engage in enhanced dialogue and consultations, the Alliance must continue to address its partnership with Russia. The Final Communiqué stresses the development of a stable and enduring partnership between NATO and Russia as essential for the security of the Euro-Atlantic area (Agreement with Russia 1997). The expansion and deepening of these relations will be pursued at both the political and military level. The Alliance further emphasises the importance of good relations with Ukraine and the role Ukraine plays in strengthening European stability (Agreement with Ukraine 1997).

The Final Communiqué of the North Atlantic Council Meeting in Defence Ministers Session in Brussels on 13 June 1996 demonstrated the Alliance's commitment to expanding the number of fora available for continuing dialogue. One example is the Mediterranean dialogue, which was established with Egypt, Israel, Jordan, Mauritania, Morocco and Tunisia. This dialogue is aimed at contributing to a better mutual understanding and ultimately, fostering stability in the region.[19]

As the inter-relationship among the political, economic, social, environmental and defence dimensions of security becomes more dynamic and complex, emphasis will be placed on co-operation with international and supranational organisations, such as the UN, OSCE and EU. The objective of this co-operation will be to introduce new mechanisms for the resolution of issues before they become threats to the "territorial integrity, political independence or security of any of the Parties" to the North Atlantic Treaty.

In late 1992, NATO developed the concept of the European Security and Defence Identity which is based

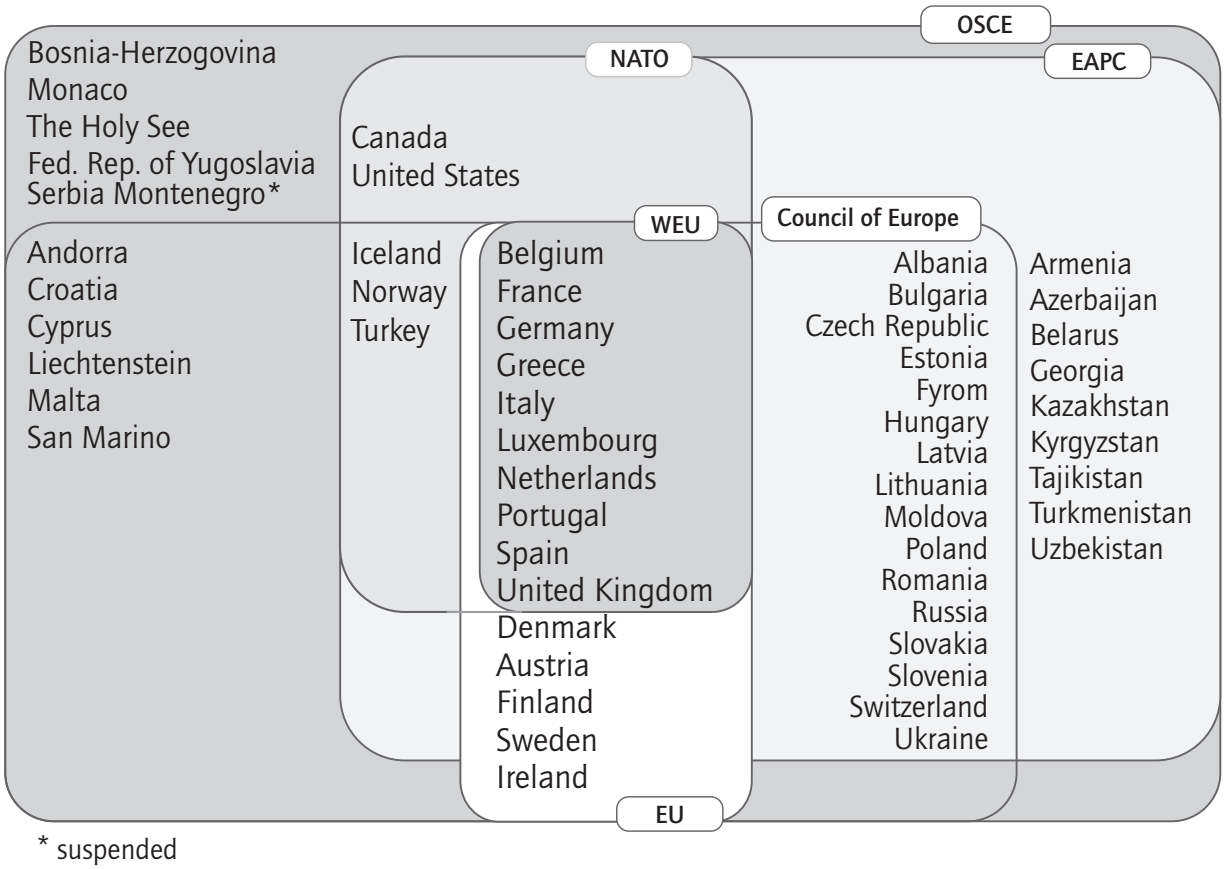
19 *NATO Basic Fact Sheet March 1996: "The European Security and Defence Identity," Number 3. http://www.nato/int/docu/basics.html.*

on a framework of mutually reinforcing institutions, encompassing the OSCE, NATO, the European Union, the WEU, and the Council of Europe.[20] The idea is for existing security organisations to work together and interact according to their specialities (see Figure 1.1).

One component of the European Security and Defence Identity, the OSCE is a regional organisation under Chapter VIII of the UN Charter. OSCE has the authority to mandate peacekeeping operations, conflict prevention and management, and foster economic co-operation and development throughout its area of responsibility.[21]

It does not have the authority to launch peace enforcement operations. The size of its membership and the heterogeneity of its members makes the OSCE indispensable for a comprehensive security in Europe,

Figure 1.1 - European Security and Defence Identity Framework



* suspended

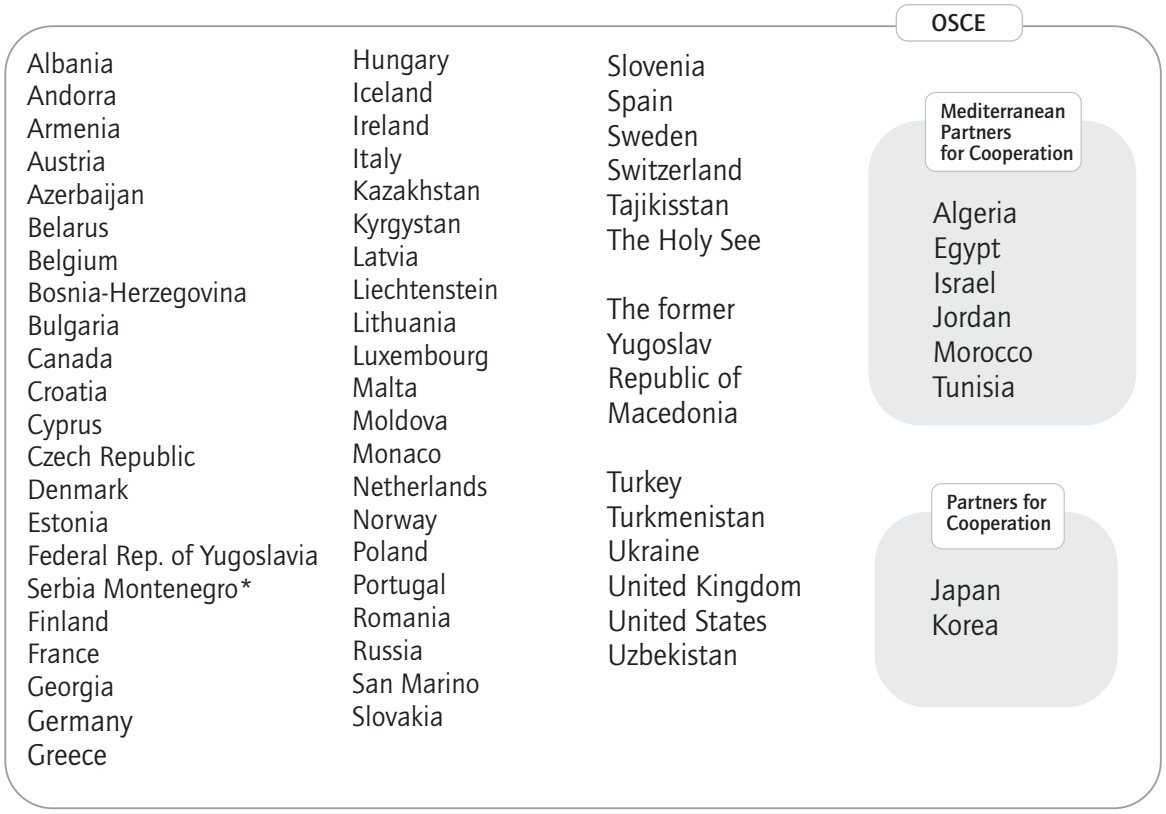
20 *NATO Basic Fact Sheet, March 1996: "Alliance Interaction with the Organisation for Security and Co-operation in Europe," Number 6 http://www.nato/int/docu/basics.html.*
Note: The NATO Basic Fact Sheets referenced above are not a formally agreed NATO documents and do not therefore necessarily represent the official position of individual member governments on all policy issues discussed.

21 *NATO Basic Fact Sheet, March 1996: "Alliance Interaction with the Organisation for Security and Co-operation in Europe," Number 6 http://www.nato/int/docu/basics.html.*

while restricting its range of action (see figure 1.2). Questions of international security show a distinct tendency for using regional structures or ad-hoc coalitions of like-minded states to resolve local and regional conflicts, including conflicts influenced by environmental stress. Decisive action is required prior to the development of a credible threat to security.

In contrast to ad-hoc alliances, NATO's concept of Combined Joint Task Forces (CJTF), presented in Brussels in 1994, represents a substantial step towards creating more flexible forms of multi-national action in support of conflict prevention and crisis management.

Figure 1.2 - OSCE Membership



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CJTF concept achieves three aims:

(1) It is possible to conduct non-Article 5 out-of-area military operations using varying participation of the NATO partners.

(2) NATO nations' forces can be employed under NATO command as well as WEU leadership.

(3) Non-NATO members - especially PfP partners - can actively participate in NATO's military actions for for crisis management and conflict resolution.

With the CJTF concept, NATO has made a decisive step towards increasing the flexibility of its possible responses. However, beyond data collection and monitoring, NATO does not have the capacity for preventive action, relying on co-operation with other organisations that are mandated in the respective fields of environmental, economic and development co-operation.

1.7 Conclusions

In the context of current NATO reforms (i.e., new command structure, new Member States, enhanced NATO and WEU ties, NATO-Russia-Founding-Act, the special relationship with Ukraine, EAPC, Enhanced Partnership for Peace (EPfP), and the continued development of the Strategic Concept) the Alliance will face fundamental changes up to and beyond the year 2000. With the gradual development of more flexible structures, NATO is likely to become increasingly involved in a broader spectrum of possible action. In this context, NATO needs to take into consideration the impact of the negative consequences of environmental stress on the potential incidence or escalation of conflict in monitoring and assessing regional security. It will need to develop its ability to co-ordinate with international institutions with other specialised functional competencies and jurisdictions, as well as other security organisations, when faced with non-traditional security threats. Adapting to new realities will take time and co-ordinated effort on the part of the Member States. The structural and political changes underway will continue beyond the scope of this Pilot Study.

Assessing the Links between Environment and Security 2

Key Findings

- *Environmental stress comprises scarcity of natural, renewable resources (quantitative degradation) as well as qualitative resource degradation. As both factors are closely interconnected – environmental degradation can increase scarcity as well as scarcity can further degrade a resource by overexploitation - they are considered as one variable in the context of the Pilot Study.*

- *Conflict is understood as a dynamic process with different levels of intensity along a continuum ranging from highly co-operative to highly conflicted situations (durable peace, stable peace, unstable peace, crisis, war).*

- *Violence is by no means the automatic outcome of conflict. Countless issues of conflict, particularly at the local or regional level, are resolved co-operatively; only a limited number reach a higher conflict intensity.*

- *The relationship between environmental stress and conflict is characterised by:*

  - *Multi-causality: environmental stress contributing to conflict almost always interacts with other political, social and economic factors and evolves through various multi-stages before it results in conflict;*
  - *Reciprocity and feedback loops: the relationship between environmental stress and conflict is recursive; because just as environmental stress can lead to conflict under unfavourable 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 mportant consequences from environmental stress, which then contribute to conflict under a certain set of unfavourable contextual factors.*

- *Environmental stress can also play different roles along the conflict dynamic. It can be a structural source of conflict, 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.*

2.1 Introduction

The relationship between environment and security has been under consideration for more than a decade. The discussion has been driven largely by two communities: the environmental policy community addressing the consequences of environmental change and the security community looking at new definitions of national security in the post-Cold War context.

Environmental issues were acknowledged as an important issue on the international agenda at the United Nations Conference on the Environment in Stockholm 1972, which resulted in the foundation of the United Nations Environment Programme (UNEP). Another step in raising international awareness of the potential effects of global environmental change was the establishment of the World Commission on Environment and Development at the UN General Assembly in 1983. It released its report "Our Common Future" in 1987, which presented the principle of sustainable development for the first time to a broader public (WCED 1987). As a guiding principle, sustainability proposes that future generations are to be given a world which allows them to fulfil their needs to no lesser extent than the current generation. With respect to these needs, three dimensions of sustainability can be identified: the ecological, the social and the economic. The substance of the sustainability concept involves the complex task of integrating the different demands and goals.

The growing global concern for the environment over the last 30 years culminated in the United Nations Conference on Environment and Development in Rio de Janeiro in 1992 which made a major contribution to the recognition of environmental issues in the international arena. At this watershed conference, the principle of 'sustainable development' was first introduced to the global community. There was a general acceptance of the idea that environmental, economic and social issues are interdependent and cannot be pursued separately. Since then the principle of sustainable development has become a general principal of action in the field of environmental, economic and development policy.

Also in 1992, the Commission on Sustainable Development (CSD) was established as a UN body involving high level policy-makers. The aim of the CSD is to realise the concept of sustainable development while supporting the co-ordination of the different environmental agreements and policies. In the UNCED framework, additional environmental agreements and international conventions were signed, including the United Nations Framework Convention on Climate Change (FCCC) and the Convention on Biological Diversity (CBD). The Convention to Combat Desertification (CCD) was signed in 1994. Each agreement recognised the linkage among environmental and socio-economic issues in one way or another. In parallel to this development, a large number of bilateral and regional agreements were concluded, which regulate the distribution and use of natural resources, notably water. Today there are almost 200 international environmental agreements in existence. On the national level, the rising awareness of the impact of environmental change on human well-being has been demonstrated by the institutionalisation of environmental policy through government agencies and environmental legislation.

The political science realm also became aware of the environmental issue, placing it into their familiar analytical and policy categories of 'security' (Matthew 1995: 16). This approach attempted to 'redefine' the concept of national security to include environmental concerns (Brown 1977; Ullman 1983; Matthews 1989). Political scientists have also analysed a growing number of environmental agreements among countries within the framework of international and regional regimes that provide continuity and sustainability to environmental decisions, as well as institutional approaches to resolving conflicts among regime members.

Since the end of the Cold War traditional security concepts based on national sovereignty and territorial security have increasingly been brought under scrutiny. Instead, a broader definition of security would incorporate the role of non-traditional threats to security such as economic decline, social and political instability, ethnic rivalries and territorial disputes international terrorism, money laundering and drug trafficking and environmental stress. In particular, the relationship between environment and security has been of increasing importance in recent years in both the scientific and policy communities (Myers 1989; Kaplan 1994).

Research on the relationship between environment and security is addressed in a number of research efforts.[22] Several of these research projects aim to

'redefine' or broaden the concept of security to include social, economic and environmental factors (Brown 1977; Ullman 1983; Mathews 1989). In contrast to the narrower classical concept of security, the broader concept proceeds from a differentiation of levels of analysis (individual, national, regional and international security).

Other projects approach the debate by differentiating the factors which affect security. More conceptual, they address the conditions under which global change and environmental degradation lead to violent conflict. They attempt to establish a causal relationship between environmental factors and conflict through case study based research projects.[23] Researchers are also attempting to derive conclusions about the 'general' importance of environmental stress in the incidence of conflict.[24] Additionally there is research focusing on the human dimension and its role in environmental change and security and the role of climate change and its socio-economic impacts and violent conflict.[25]

Considering the complexity of the causal pathways of the relationship between environmental change and security, the objectives of the Pilot Study are to describe this relationship coherently and to develop possible policy responses for stakeholders. The present chapter will lay the foundation, elaborating on the relationship between environmental stress, its political, economic, social and demographic consequences and their impact on security by interpreting the research literature. Due to its focus on policy options, the study seeks to clarify the general linkages rather than creating a predictive, testable model.

The chapter is structured as follows:

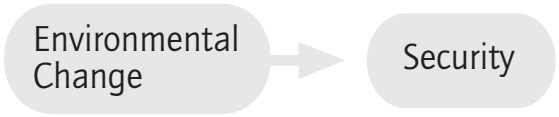
(1) Clarify the concepts of environmental stress and security;

(2) Examine the consequences of environmental stress and their potential impact on the incidence or escalation of conflict;

(3) Discuss the underlying contextual factors, which may ameliorate or amplify the impact of the consequences of environmental stress.

The original hypothesis of the study is that environmental change impacts on security, as depicted in Figure 2.1

Figure 2.1 - Original Hypothesis



22 *The environment and security debate in policy and academic arenas has been fostered by the publications of Lester Brown, Richard Ullman, Jessica Matthews, Norman Myers and Robert Kaplan.*

23 *These include the following research projects: the Project on Environment, Population and Security, conducted by Thomas Homer-Dixon of the Peace and Conflict Studies Program of the University of Toronto and the American Association for the Advancement of Science-AAAS (Homer-Dixon 1991, 1994) and the Environmental Conflicts Project (ENCOP) led by Thomas Spillmann and Günther Baechler of the Swiss Peace Foundation (Baechler 1996).*

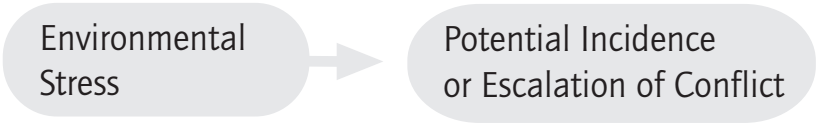
24 *Several projects, for example the International Peace Research Institute-Oslo (PRIO) under the head of Nils Petter Gleditsch, use quantitative methods to look for correlation between different types of environmental degradation and conflict (Gleditsch 1997).*

25 *The Global Environmental Change and Human Security Project (GECHS) of the International Human Dimensions Programme, University of Victoria, Canada under the Chair, Steve Lonergan (Lonergan 1995) and the Dutch National Research Programme on Global Air Pollution and Climate Change (Ierland, Klaasen, Nierop and Wusten 1996).*

The concepts of environmental change and security are very broad and subject to multiple interpretations. As a result, it was necessary to clearly define how the Pilot Study would employ these variables.

The operationalised hypothesis is as follows: environmental stress impacts the potential incidence or escalation of conflict. The operational hypothesis is depicted in Figure 2.2.

Figure 2.2 - Operational Hypothesis



2.2 Clarifying the Concepts

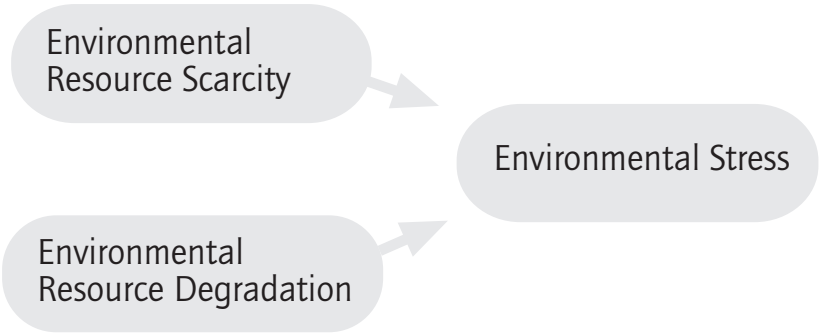
2.2.1 Environmental Stress

We conceive of environmental change in terms of the nature and extent of environmental stress. Environmental stress can be the result of two factors. The first factor concerns the scarcity of renewable natural resources, which involves the reduction or perceived reduction in the total quantity or available quantity of natural resources such as arable land, fresh water, forests, or fish stock.[26]

The second factor is environmental degradation. It is increasingly difficult to differentiate between natural and anthropogenic environmental changes because of growing human interaction with eco-systems; such changes often result in the degradation of renewable natural resources (Carius et al. 1997: 59). Environmental degradation and scarcities of renewable natural resources are closely connected, as degradation can increase scarcity and tensions over distribution and access, while scarcity of a natural resource can degrade the resource through overexploitation. Due to this close connection, the term environmental stress is used in this study to characterise both problems; it is employed in our study as the independent variable (see Figure 2.3). Environmental stress includes anthropogenic degradation, natural systemic variability and natural disasters. Furthermore, environmental stress has the potential to be a transboundary phenomenon, imposing consequences without respect to internal or international political borders.

26 *In the context of the study, cases involving non-renewable natural resources such as coal, oil or minerals will not be emphasised.*

Figure 2.3 - Environmental Stress



2.2.2 Security

Security is the dependent variable in our analysis. It is traditionally understood as the absence of threats to national sovereignty. This understanding of security includes three dimensions.

(1) The integrity of the national territory;

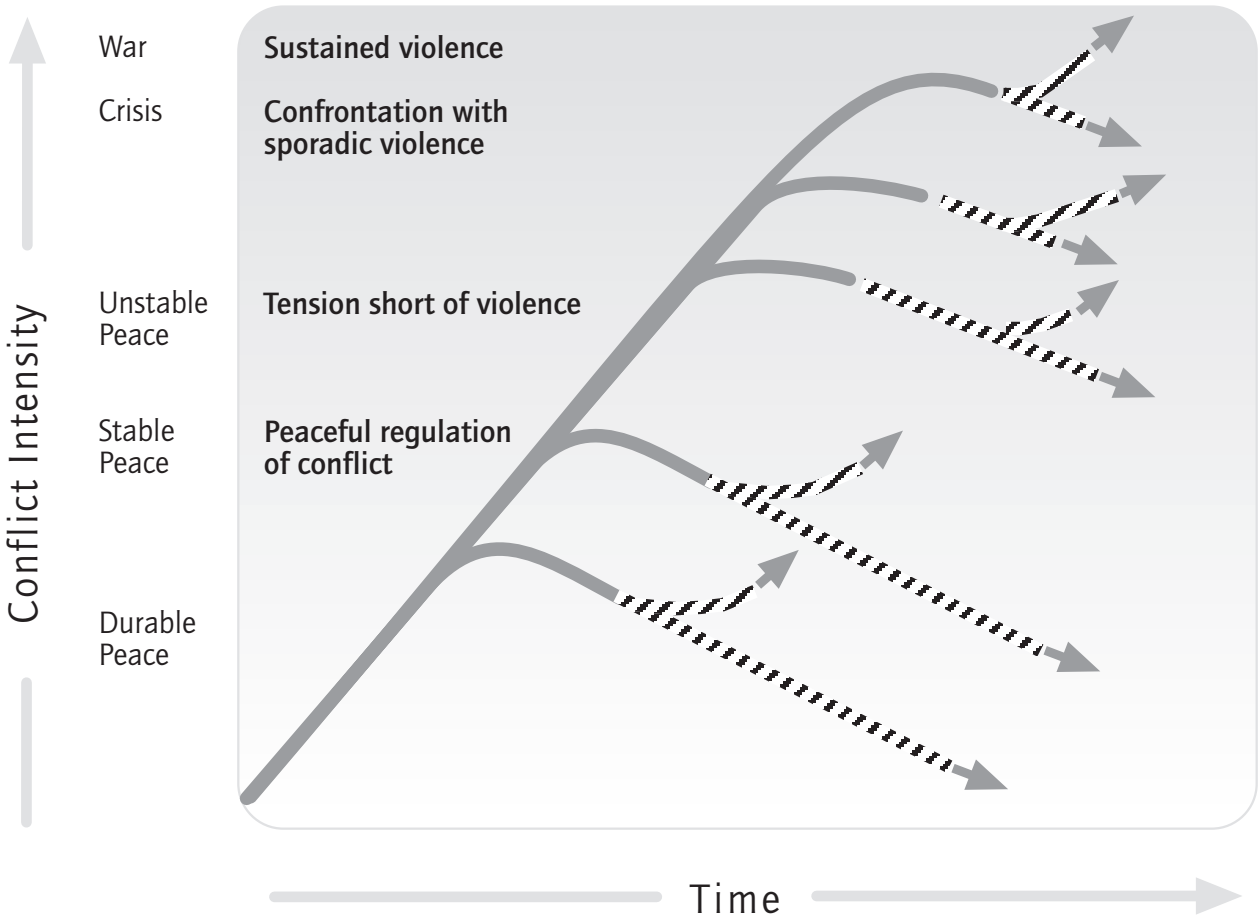
(2) The protection of political independence and national sovereignty, and;

(3) Stability at the international level.

The inverse of these conditions can be characterised by our operationalised dependent variable, the potential incidence or escalation of conflict. Conflict is defined simply as a difference in positions or interests among actors with respect to a specific issue or goal. For the Pilot Study, the specific issues are the consequences of environmental stress.

Conflicts are understood as dynamic processes that exhibit different levels of intensity along a continuum. We depict the conflict dynamic as movement over time along a scale of conflict intensity (see Figure 2.4).

Figure 2.4 - Conflict Dynamic



This figure identifies the possible evolution of a conflict ranging from highly co-operative to highly conflicted situations. Depending on a variety of factors, a conflict situation can evolve through five levels of increasing intensity (adapted from Lund, 1996). These are:

(1) Durable Peace: Situations characterised by shared common purpose, harmony, and no incompatible interests.

(2) Stable Peace: Situations of significant co-operation, but with the recognition of incopatible interests, that are regulated by peaceful mechanisms that reduce, manage or resolve disputes and prevent violence.

(3) Unstable Peace: Situations of tension and suspicion that avoid violence by mutual deterrence, balance of power or government repression.

(4) Crisis: Situations of tense confrontation between armed forces, engaging in threats and possible skirmishes, but without significant and sustained force.

(5) War: Situations of sustained and systematic use of armed force.

This conflict dynamic suggests that issues can be resolved before conflict develops into a security threat (levels of durable peace and stable peace). Above these levels conflict produces political, economic and social crises, but not sustained violent confrontation (unstable peace). Only at its highest levels (crisis and war), does conflict evolve into continuous violent confrontations.

Figure 2.4 also shows that violence is by no means the automatic outcome of conflict. Depending on the policy measures applied and the contextual factors, situations with a potential for escalation may also be managed to decrease in conflict intensity. Countless issues of conflict, particularly at the local or regional level are resolved co-operatively; only a limited number reach a higher conflict intensity.

Conflicts can manifest themselves at different geographical levels. There are domestic conflicts which appear at the sub-national level and which often do not escalate beyond borders. At the same time, conflicts can emerge at the international level, involving states or social groups from different states.

The Pilot Study focuses, in particular, on cases that are likely to surpass the levels of durable and stable peace, so as to determine the conditions under which violent escalation is likely. From a practical perspective, these conflicts deserve the highest priority in order to prevent the use of violence. Nonetheless, additional cases are taken into consideration which remain well below the level of unstable peace. They are used to demonstrate the importance of contextual factors for the incidence and escalation of conflict. Those cases are also examples of how favourable contextual factors and appropriate mechanisms of conflict resolution can reduce or eliminate the incidence or escalation of conflict.

2.3 Links between Environmental Stress and Conflict

Empirical research has shown that there is no direct, mono-causal relationship between environmental stress and conflict. Instead, environmental stress is understood as one of several factors that can produce conflict (Baechler et al. 1996; Homer-Dixon 1994). For example, inefficient economies, unjust social systems, and repressive governments, can predispose a society to instability and make it especially susceptible to environmental problems (Myers 1993:22). This means that environmental stress is embedded in a broader context of factors which can contribute to or accelerate the incidence or escalation of conflict.

At the same time, environmental stress does not necessarily lead to conflict or the outbreak of violence. On the contrary, the vast majority of cases exhibiting environmental stress are resolved peacefully and co-operatively. In some instances, co-operative approaches to tackling environmental stress provide the opportunity to begin resolving longstanding and historically complex conflicts. The effort in international water management focusing on the Jordan River Basin is an example. There is no direct link here between environmental stress and conflict, nevertheless the mode of conflict resolution produced movement in other political conflict domains.

The following phenomena characterise the relationship between environmental stress and conflict.

2.3.1 Multi-causality

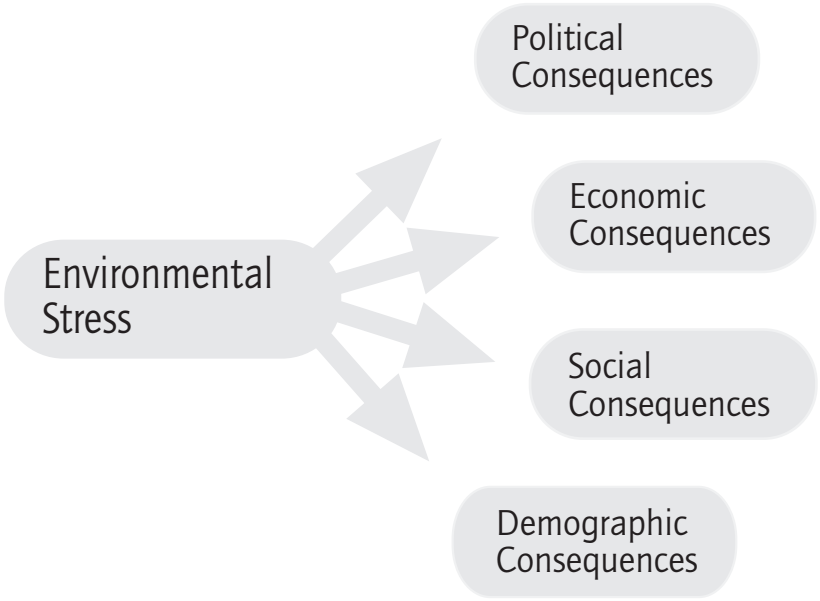
Environmental stress contributing to conflict almost always interacts with other political, economic and social factors. Thus the number of factors which build the link between environmental stress and conflict are multiple. It is also impossible to generalise whether environmental stress was the necessary condition in the development or escalation of a conflict.

Environmental stress evolves through various stages before it results in violence. Empirical research has shown that environmental stress often leads to the kinds

of problems that are both socially and economically induced such as migration, displacement, poverty, food insecurity or poor health conditions. It may also lead to political instability. However, a distinction in the effects of environmental degradation and scarcity of renewable resources can be made with regard to the immediateness of its consequences: "Environmental decline occasionally leads directly to conflict, especially when scarce water resources must be shared. Generally its impact on a nation's security is felt in the downward pull on economic performance and, therefore, on political stability" (Matthews 1989). This means that if and only when environmental degradation manifests itself in societal problems, such as socio-economic decline, might it lead to crisis which can end in violence (Baechler 1997).

Environmental stress has political, economic, social and demographic consequences, as depicted in Figure 2.5, which contribute to and compound more serious socio-economic and political problems.

Figure 2.5 - Consequences of Environmental Stress



2.3.2 Reciprocity/feedback loops

The relationship between environmental stress and conflict is replete with feedback loops and recursive relationships. At its most general level, environmental stress can lead to conflict under unfavourable contextual factors and conflict can, in turn, generate more environmental stress. For example, conflict between different social groups can lead to more environmental stress when one of the groups moves to a more vulnerable environmental region, such as mountain forests. At the same time the relationship between environmental stress and conflict is non-linear.

The socio-economic and political consequences of environmental stress may impact on the rate of degradation or on the perceived degree of scarcity. This feedback mechanism, combined with contextual factors, can raise the probability of the incidence of conflict. For example, unequal land distribution contributes to environmental stress such as soil overconflict. For example, unequal land distribution contributes to environmental stress such as soil overuse, enhancing the conditions for conflict (Libiszewski 1992: 5). Environmental stress factors may manifest themselves in various ways. Cases involving scarce resources may have a higher potential for escalation along the conflict dynamic than those primarily involving environmental degradation. Environmental degradation in general is notable for the fact that it tends to require a greater contribution from other factors before raising the potential incidence or escalation of conflict.

2.3.3 Consequences of Environmental Stress

Poverty, food insecurity, poor health conditions, displacement (migration or refugee movements), and disruption of the social and political institutions can be regarded as the most important consequences of environmental stress, which then contribute to conflict under a certain set of unfavourable contextual factors (Goodrich and Brecke 1997:2). For example soil degradation can lead to declining agricultural production, economic hardship, migration of people from areas of economic stress, and tensions within and among groups, which contribute to conflict. Migration or refugee movements are one of the most often experienced results of environmental stress. Migration and flight can result in hardship, food scarcity and health problems among displaced persons; as such it will not necessarily lead to violence, as the displaced people are usually too weak to fight for their share of necessary resources.

Human displacement can undermine social and regulatory institutions. In the country of origin, the government's legitimacy decreases due to its inability to resolve the socio-economic problems and the underlying environmental factors. Second, displacement can lead to disruption of the institutions of the receiving region or country if it is not capable of dealing with the influx of displaced people. This is especially the case when displaced people or migrants (who may be ethnically or culturally separate and distinct) move to other ecologically sensitive or degraded areas and must compete with local populations for now scarce resources, as it was the case in Rwanda and Zaire.

The interrelationship between environment and security is far more complex and less linear than has been commonly described. According to the result of many case studies conducted in the last decade, the conclusion is that environmental stresses are but one factor among others contributing to the incidence or escalation conflict (Homer-Dixon 1994; Baechler et al. 1996; Hauge and Ellingsen 1998). Political, economic, social and demographic issues are at least as relevant to the incidence of conflict as environmental stress (see Figure 2.6). The result is that the consequences of environmental stress can also be regarded as independent variables.

However, the aim in the context of the Pilot Study is not to determine the whole range of factors which explain the incidence of conflict. Rather one specific variable from a range of potential influential factors is isolated and analysed in its interaction with other variables. The Pilot Study thus does not ignore the influence that socio-economic and political factors have on the outbreak of conflict. Rather, the research focuses on the interaction between these factors' effects, as influenced by environmental stress.

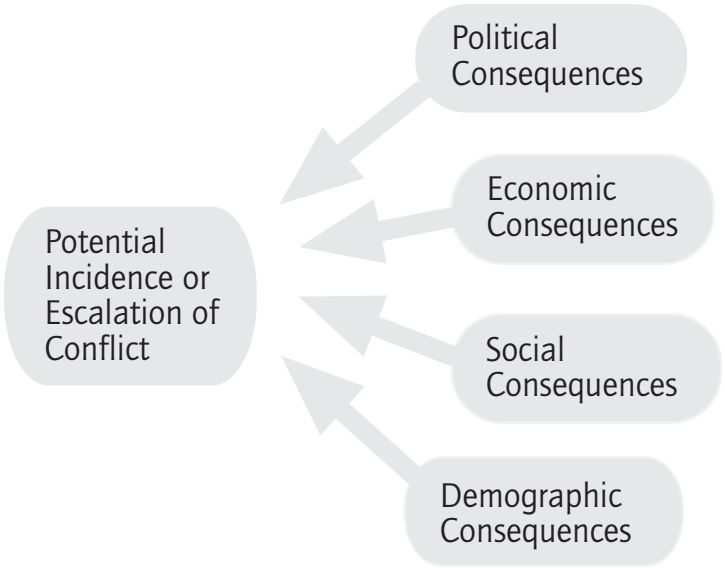
As a result, environmental stress can play different roles along the conflict dynamic:

(1) Structural Source of Conflict: Environmental stress is perceived as a permanent factor affecting the interests and preferences of the actors involved.

(2) Catalyst for Conflict: Environmental stress is further exacerbated by an existing unstable socio-economic situation and the resulting impact is an increase in the potential incidence or escalation of conflict.

(3) 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 unfavourable sudden change in the environmental sphere (this categorisation is based on Baechler 1997: 132-136).

Figure 2.6 - Relationship of the Consequences of Environmental Stress to the Potential Incidence or Escalation of Conflict

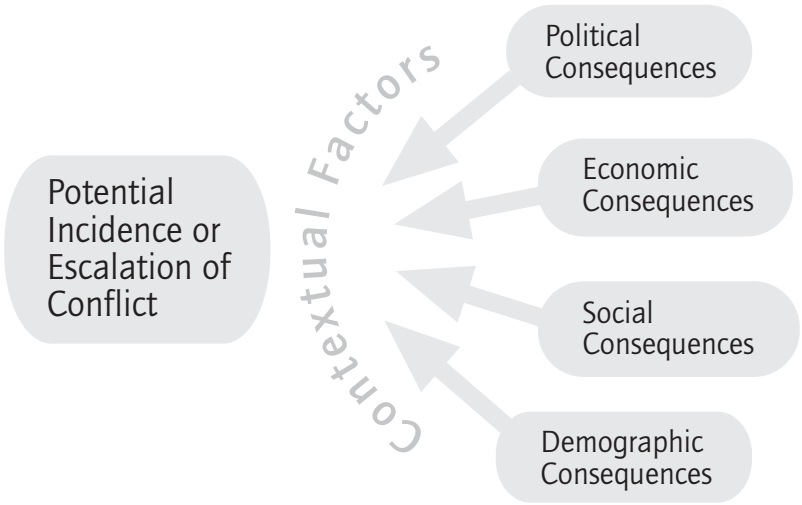


Environmental stress factors thus can influence the process at different stages. In the Pilot Study framework, there is no focus on a specific group of environmental stress factors at a specific point of the process. Rather those critical socio-economic situations are examined, which would not have appeared or would not have assumed these alarming proportions in the absence of environmental stress.

2.4 Contextual Factors

Comparing different case studies of environmental stress has revealed that similar types of environmental stress may have different outcomes. For example, migration due in part to environmental stress in Bangladesh to Assam, India led to violence in the receiving region, while migration due to environmental stress from Bangladesh to other Asian states or even other parts of India did not lead to violence in the receiving country (Suhrke 1997: 258). Thus, it is not the environmental stress in isolation that characterises the nature of conflict between groups, but there must be other factors decisively influencing this process. This example shows as well that it is finally the stakeholders who decide whether environmental stress results in co-operation or conflict. Therefore socio-economic, political and cultural factors, which constitute the actors' attitudes, have to be taken into consideration in characterising a manifestation of conflict (Carius and Imbusch 1998; Baechler et al. 1996: 318). The context in which environmental stress occurs and in which the involved parties act must be integrated in an analytical framework addressing its potential for conflict (see Figure 2.7).

Figure 2.7 - Contextual Factors that Enhance or Inhibit the Impact of the Consequences of Environmental Stress



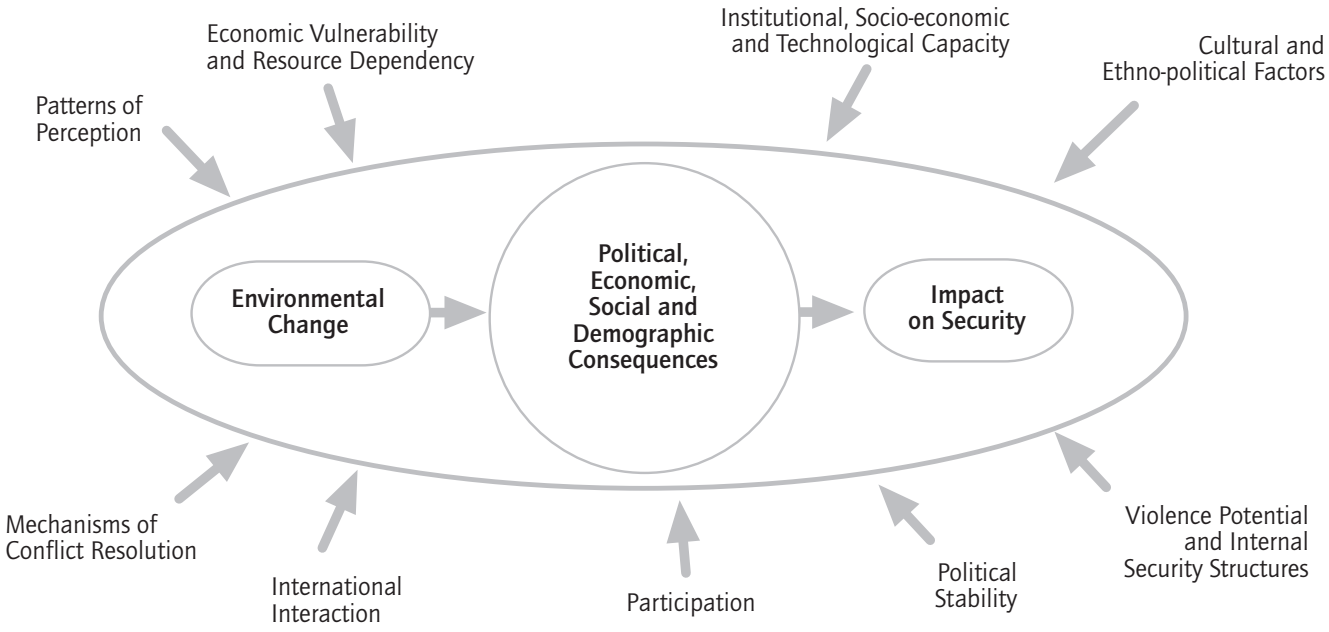
Theories of conflict research distinguish between structural factors and triggering factors influencing the conflict dynamic. Structural factors are long-term, more static factors such as certain patterns of economic organisation, distribution of wealth and land, or ethnic stratification within a society. They are understood to create a certain general climate within society, in which a certain form of conflict behaviour is more likely to occur than another form. In contrast to structural factors, triggering factors are acute events (OECD-DAC 1997: 11). An example might be the overthrow of a government or assassination, as in the case of Rwanda, which escalates an underlying or latent conflict. These triggering factors would, however, not result in the use of force without suitable structural factors.

Relating back to our original hypothesis on the relationship between environmental change and security we have developed a conceptual model (figure 2.8). The figure shows that contextual factors influence whether environmental change causes social, economic and political consequences which in turn impact on security.[27] For example in the case of drought, there can be a resulting decline in cereal production. Whether this environmental problem leads to problematic food supply, depends on the country's problem solving capacity, through substituting this deficiency by grain imports, for example.

Contextual factors influence the process at a very early stage and vary according to the different environmental stress conditions characterised within a country.

27 *Any existing feedback mechanisms are not included in the figure because its purpose is to depict possible pathways for environmental stress to influence the incidence of conflict.*

Figure 2.8 - Conceptual Model: Relationship Between Environmental Change and Security



While a country with sufficient economic and political capacities can resolve social problems such as coping with a large number of refugees, a poor country with an unstable government would have difficulties. Contextual factors can also have either a facilitating or inhibiting effect on the relationship between environmental stress and conflict. Thus, contextual factors are of relevance at every stage of the process, they underlie the process and influence the direction in which groups react to environmental stress. The following paragraphs describe the contextual factors identified in the figure and present the conceptual relationships amongst these elements.

2.4.1 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. Perception influences the position regarding environmental stress. Resource scarcity is not a scientifically defined benchmark; it largely a factor of perception. For example, suppose that it is scientifically determined that 50 litres of water per person per day is the basic typically consumes 150 litres of water per person per day suddenly experiences a drop in available supply to 75 litres (still above the basic minimum), a perceived reference value may be reached and the perception of scarcity may be high, even if the scientific threshold has not been breached. However, if a country that consumes 55 litres per day drops to 45 (below the minimum), the population may sense the change, but the impact may not be perceived as severe enough to influence or trigger a conflict (Spector 1998). As in the case of this hypothesis, if environmental stress is perceived as directly impacting an actor's interests and priorities, including threats to their physical or economic well-being, actors are more willing to escalate the potential for conflict.

It is also important, whether the stakeholders perceive another group as responsible for their impaired well-being. If environmental change happens very slowly and cannot be attributed to a specific actor, or if it is perceived as a 'natural catastrophe' rather than as an avoidable consequence of human activity, it is unlikely that the impacted group will use force against others (Baechler 1997: 134).

2.4.2 *Economic Vulnerability and Resource Dependency*

Dependence on natural resources is another important issue influencing the potential incidence of conflict. Developing countries are at a higher risk because they are more directly dependent on their natural resources as part of the nation's wealth. Dependence differs enormously among countries, but also among regions or social groups. At the subnational level, actors' dependence on natural capital may differ significantly in terms of economic activities, modes of production, and productivity. The vulnerability caused by heavy dependence on a degrading resource may lead to 'inevitable conditions' for a part of society, limiting the range of peaceful alternatives to resolve the environmental problem. Migration or flight are often the result of an extreme dependence on a degrading resource, causing socio-economic and political stress in the receiving nation or state.

If one part of society is deliberately discriminated against regarding access to a vital natural resource - such as fresh water - this can enhance the probability of the incidence of conflict. One consequence can be that the discriminated group organises for action against other groups it perceives as responsible for their condition. Both the perception and fact of environmental stress enhance identification of individuals with their own group which is viewed as an individual actor against other individual actors. Thus group cohesion triggers inter-group struggles over degrading resources along different fault lines such as: inter-ethnic strife, immigrants vs. residents, farmers vs. nomads, and rural vs. urban dwellers.

2.4.3 *Institutional, Socio-economic and Technological Capacity*

Institutional capacity of a government is another precondition for co-operative action on environmental stresses and their consequences. Institutions are understood as generally acknowledged systems of rules. While looking for a definition of institutional capacity four aspects should be considered:

(1) The capacity to establish a framework which is the guiding behaviour of the population and the government itself;

(2) The political system's capacity to establish rules for an effective performance;

(3) The political system's capacity to enforce its decisions and policies;

(4) The political system's responsiveness and ability to listen to the concerns of the population and its ability to react accordingly.

A country's capacity to establish environmentally sound legislation and mechanisms to comply with international environmental agreements is an example of institutional capacity. Developed countries, particularly with well-established democratic systems, have the institutional means at their disposal, such as environmental authorities or agencies and environmental administration at the regional and local levels. Another important factor is the capacity provided by groups within the society, amongst them non-governmental organisations or green movements at all levels of society. These groups play an important role in providing information to policymakers and the public. They help to make the existence of environmental stress public at an early stage, so that solutions can be found before the stress escalates into potential conflict.

The creation, distribution and application of knowledge can be seen as preconditions for the amelioration of the negative consequences of environmental stress and to preventing potential conflict. Of special importance is educating policy makers and the public on

environmental stresses and their potential consequences in order to garner support for resolution. This requires the availability of specialists who are capable of analysing environmental stresses and policymakers who have the will and the capability to develop, implement and enforce solutions (Jaenicke and Weidner 1997).

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. To deal appropriately with environmental stress, a government should have the ability to bring to bear a large array of economic, social, technological and institutional instruments. These include amongst each other: suitability and support of crop choices, sustainability/ productivity of land, access to markets, credit and cash availability, land property rights, and subsidiary resource management mechanisms. These instruments create a prerequisite for effective local self-government and sustainable resource management.

2.4.4 Cultural and Ethno-political Factors

The existence of ethnic, cultural or religious differences within a state do not in themselves lead to conflict, but they can contribute to the incidence or escalation of conflict, if they develop into a political problem. These differences may be exacerbated by an inequitable distribution of wealth, services and access. For example, if parts of the population are barred from the access to and use of a natural resource (see the case of Sudan, Baechler et al. 1996), this may reinforce social cleavages and generate civil unrest (Homer-Dixon 1991: 72). Another potential source of group conflict is migration, specifically migration that may bring together people from different and distinct ethnic, economic and cultural backgrounds. It should be kept in mind that every other aspect which dissociates one group from another - rural vs. urban origin, pastorals vs. farmers, highlanders vs. lowlanders (Baechler 1997: 113) - is of the same explanatory importance as ethnicity.

2.4.5 Violence Potential and Internal Security Structures

Violence potential first means that an actor is able to and willing to use violence. Second, the actor must be able to create a collective entity and to find allies which share its position towards the conflict issue. It further depends upon the possibility to develop a conflict strategy and to have the necessary means for violent conflict settlement. The absence of these preconditions explains, for example, why environmentally displaced people do not generally start violent actions against the hosting society, but are rather the object of violence. Due to their isolation, they lack the necessary conflict potential, group cohesion and determined capacity of action (Suhrke 1993). The result is that they lack the capability to instigate, but they also lack the capability to successfully resist or deter the actions of the host society.

Linked to the violence potential of social groups as a precondition to conflict escalation is the internal security structure of a society. The incidence of conflict or the escalation to violence may be determined in part by the degree of civilian control of the military, the internal security services and law enforcement agencies. If these democratic structures do not exist, and these institutions are dominated and potentially instrumentalised by a certain group in the society, they might be used as a tool to resolve potential conflicts by force.

2.4.6 Political Stability

Social and economic factors are closely interlinked with the political dimension of the state. Generally the potential incidence of conflict is high in the presence of poltical instability. Instability exists when the political system and the government are unable to effectively control or reconcile tensions between different groups in the society or between the government and the opposition. Changes in social and economic factors may negatively influence the political situation of a state. For example, social tensions or economic strains may cause political crisis, and in severe cases even disrupt the stability of the political system. Even though

democracies are usually more peaceful than other states, varying degrees of conflict are not uncommon particularly in new democracies since their political system may not be sufficiently stable. For further analysis on the importance of political stability in conflict analysis, refer to the in-depth analysis of Professor Peter Wallensteen from the Uppsala University (Wallensteen 1992).

2.4.7 Participation

Research on cases of environmental stress has shown that in many instances local groups who were directly affected by the decision, for example the exploitation of a resource, and who were not involved in the decision-making process, had a low acceptance rate of the decision itself (see Volker Böge's case study on Bogainville, Nigeria 1997: 539-649). This was reinforced by the fact that often the loss of resources and destruction of traditional distribution of property were not compensated by the decision-makers (Baechler 1997: 230). Participation can be realised through mechanisms such as free and fair elections, petitions, or it can be realised through traditional or culturally-specific mechanisms. More important than the mode of participation as such is the acceptance of the procedure by the people. A legal system which is accepted by the popu-lation and accessible for everybody who needs legal support is of similar importance for a stable state. This also includes accepted practices for the adjudication of claims against the state and local government.

2.4.8 International Interaction

International interaction or regional and international integration are likely to reduce the incidence of conflict. The constructive engagement of a country in international interactions enhances co-operative resolution of the negative consequences of environmental stress. It encourages a state to adhere to international environmental treaties, comply with international regimes, and adjust to international standards (Gleditsch 1997).

2.4.9 Mechanisms of Conflict Resolution

The presence of effective and legitimate legal, political and social mechanisms of conflict resolution enhances the possibility of resolving conflict within a state or between states. If these are generally accepted and thus institutionalised, it is less likely that the consequences of environmental stress will lead to the incidence or escalation of conflict.

At the international level, specific regimes which were created to regulate transboundary pollution or distribution issues are a good example. Due to these institutionalised conflict resolution mechanisms, for example water conflicts in and between industrialised countries, are settled by peaceful means. The dispute settlement capacities of the Rhine Commission in Western Europe serve as an example. In this context the parties' high degree of negotiating competence due to much negotiating practice is a related reason for the co-operative resolution of conflicts. Given these mechanisms, environmental stresses can be a catalyst for co-operation if political compromises are seen as desirable and technical solutions as feasible.

Also at the national level, the presence of mechanisms of conflict settlement play an important role in avoiding the incidence or escalation of violence. In a political system with working mechanisms of conflict resolution, power relationships are mediated by legal barriers and rules of behaviour. Negotiations and compromises allow a co-operative handling of the environmental stress. In addition to the existence of formal legal, institutional and political mechanisms,

civil society can provide important mechanisms for the resolution of conflict.

Members of a functioning civil society can form and articulate interests autonomous from state institutions and authorities. However, civil society does not only obtain mechanisms for the participation in political decisions, but can act as a subsidiary corrective, providing mechanisms of self-government. Particularly at the local and regional level it can often replace government in settling local conflicts. The more stable and developed civil regulatory mechanisms are in a society, the less susceptible the society will be to violence. Nonetheless, political pluralism or the ability of opposition movements to make their claims is weakly developed where the use of violence is rife.

As a conclusion, the more established the rule of law and civil society, the lower is the use of violence and the less meaningful. In participatory societies countless and sometimes serious environmental conflicts are resolved by legal, political and social mechanisms, where negotiation, compromise and mediation play a central role.

Typology of Environmental Conflict Cases 3

Key Findings

- *A typology of environmental conflict developed in the context of the Pilot Study reflects the complexity of the relationship between environmental stress, its consequences and contextual factors as well as actors. This typology can be understood as a research hypothesis, subject to further testing since the grouping of cases used were derived inductively.*

- *Cases where environmental stress heightens the potential incidence of conflict generally manifest themselves in developing or transitional societies in socio-economic crisis. These conflicts can typically occur at the local or regional levels where marginalisation or discrimination of one or more actors is common.*

- *Four general types of environmental conflict can be identified which fulfil the complexity requirements of a typology: ethno-political conflicts; migration conflicts (internal, cross-border and demographically caused migration); international resource conflicts; and environmental conflicts due to fundamental global environmental change.*

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

3.1 Introduction

The general relationship between environmental stress, political, socio-economic and demographic consequences, contextual factors and conflict was explained in the previous chapter. To illustrate the relevance of this conceptual framework, the results of empirical research, including historical cases in which environmental stress influenced the onset of conflict, is presented in this chapter. These cases have been categorised and placed into a typology to further assist decision makers and policy analysts in understanding the relationship between environmental change and security, as well as supporting the recognition of future trouble spots based on the combination of factors that is characteristic of each category.

Several recent research projects have sought to understand the relationship between environmental stress and conflict by examining historical cases and drawing generalisations from that assessment (among these projects are the works of Homer-Dixon 1994; Goodrich and Brecke 1996; Gleditsch 1997; and Baechler et al. 1996). For the purposes of clarity, this chapter is based exclusively on the results of the Environmental Conflicts Project (ENCOP) (see Baechler et al. 1996). This project is founded on the same rationale embedded in the Pilot Study's conceptual framework. Contextual factors are viewed as critical in determining the true relationship between environmental stress and conflict potential.

A subset of ENCOP case studies used in this chapter, are drawn from several ENCOP reports (see for example Baechler et al. 1996; Baechler/Spillmann 1996 II, III) as well as from unpublished manuscripts.

Contextual factors play a major role if and when environmental stress contributes to the potential incidence or escalation of conflict. Instead of defining the category scheme and typology in terms of the different environmental components, such as land, water or atmospheric conflicts, a more complex approach was chosen that takes into account the integration of contextual factors that trigger, catalyse, and interact with environmental stress, as demonstrated in Chapter 2.

It is important to note that the ENCOP categories and typology presented in this chapter were derived from grouping the cases inductively. Thus, the typology itself can be understood as a research hypothesis, subject to further testing. At the same time, it provides a useful illustration of the shared attributes of different cases and how an understanding of such categories can help policy makers recognise the onset of future cases of environmental stress early, while there is still time to avert the emergence of conflict.

3.2 General Characteristics of Environmental Conflicts

Cases where environmental stress heightens the potential incidence or escalation of conflict generally manifest themselves in developing or transitional societies in socio-economic crisis. This is especially true if social fault lines can be manipulated by actors in such a way that social, ethnic, political, and international power struggles occur.

The cases examined provide ample evidence for the assumption that developing and transitional societies - or, to be more precise - discriminated groups within those societies, are most affected by interactions between environmental degradation, social erosion, and endemic violence. Crisis areas susceptible to conflict are found in:

(1) Arid and semi-arid plains (drylands);

(2) Mountain areas with highland-lowland interactions;

(3) Areas with river basins sub-divided by state boundaries;

(4) Zones degraded by mining and dams;

(5) Tropical forest belts;

(6) Poverty clusters of sprawling metropolises.

These sensitive areas are particularly found in Africa, Latin America, Central and Southeast Asia, as well as Oceania, where traditional society-nature relationships, regulated by cultural-specific approaches to the environmental problems, are acutely at risk.

All these cases have the marginalisation of one or more actors in common. With one major exception: inter-state conflict over shared river basins. Although there are cases where conflicts between upper and lower riparians occur in marginalised eco-regions of neighbouring states, in most cases, geopolitical and strategic security issues stand in the foreground.

However, conflicts induced by marginalisation of certain groups share the problem of discriminated access to natural resources. Thus the concept of environmental discrimination is crucial to all the conflicts under consideration. Environmental discrimination occurs when distinct actors - based on their inernational position or their social, ethnic, linguistic, religious or regional identity - experience inequality through systematically restricted access to natural capital (productive renewable resources) relative to other actors.

Most of these conflicts occur between actors within a country. In some cases, internal conflicts become internationalised. Most of those that do spread across borders involve migrants or refugees coming from war-torn or marginal rural areas of a neighbouring country. Seeking fertile land or jobs, they cause political, social, or ethno-political conflicts outside their region of origin. The internationalisation of internal conflicts can also be the consequence of new states having been created after the collapse of an empire. With the dissolution of the Soviet Union for instance, the new Central Asian republics now face water distribution conflicts which suddenly have become international in character.

Finally, there are conflicts between states that from the very beginning have an international dimension. These conflicts may result from degradation of regional

environments or the global commons. Contention surrounding the effects of global climate change (including extreme weather events, changing agricultural belts and sea level rise) are political conflicts which to date, have not had any immediate security consequences. But today, international disputes arise especially between nations mutually dependent upon the co-operative use of natural resources. Although the cases examined in the ENCOP studies did not result in violent clashes, considerable potential for military action persists.

Distinguishing among global, regional and local dimensions of conflicts would serve only as a rough orientation to environmental conflict. The boundaries among the levels are literally fluid. Classifying a given conflict at just one level, especially over time, is often impossible, because internal conflicts may be fuelled by international events, whereas the latter may be the result of an escalating domestic war. It is necessary to relate the type of environmental stress to socio-economic consequences and to parties to the conflict, herein referred to as actors.

Four general types of conflict involving environmental stress can be distinguished: ethno-political conflicts; migration conflicts (regional, transboundary and demographically influenced); international resource conflicts; and environmental conflicts due to global environmental change. It is, however, difficult to place each case into a single category. Rwanda, for instance, may be classified either as an ethno-political conflict or a demographically influenced migration conflict. For analytical clarity, each case is listed in only one category. The cases drawn from literature are listed for each type of conflict identified.

3.3 Types of Environmental Conflicts

3.3.1 Ethno-political Conflicts

Environmental and ethnic discrimination coincide in many cases. Conflicts emerge because:

(1) Two or more ethnic groups share one eco-region suffering from environmental stress,

or

(2) Ethnic groups depend on neighbouring eco-region with highly distinct degrees of productivity. In the first configuration, conflicts escalate because one or more ethnic groups have limited access to needed natural resour ces. In the second set of conditions, violence occurs if and when the environmentally discriminated group invades the territory of the neighbours who are environmentally at an advantage.

Cleavages for ethno-political conflict run along group-specific traits within ethnically fragmented societies. In a few cases, population pressure on an ecologically-sensitive region beset with environmental stress contributes to the hardening of inter-ethnic relations (e.g. Rwanda; Bangladesh and Assam Province in India).

Overuse of land, forest, and fresh water resources can lead to ethno-politically motivated conflicts, if and when they are combined with certain geographic climatic and institutional factors. In many areas of rural societies, for instance, the traditional dualism between subsistence farming and semi-nomadic livestock breeding and large-scale ranching are at stake. Since the two different producer groups usually belong to distinct ethnic or indigenous communities, the competition for resources becomes the core of an ethno-political conflict. Owing to intensive use of both ecologically favourable areas with high fertility and unfavourable areas with low fertility by a growing number of rural

producers, ethnically-defined living space is giving way to ethnic mixing and social stratification. This process, which largely contributes to new clusters of ethnic groups facing environmental discrimination, is triggered by environmental stress. It may also be aggravated by modernisation processes, protracted violence or wars.

Huge areas of the most fertile land are under cultivation for mono-cultures (food and most often cash crops), or are being used by central governments for commercial purposes (such as wildlife parks for tourism). As a result, increasingly less productive land remains exclusively for labour-intensive food crops. Rural populations put pressure on available land and further stress the landscape.

However, identity groups - whether tribes, clans, or ethnic groups - are in general not willing to surrender land which they claim as the land of their ancestors. Historically, land use and land tenure disputes have led to deliberate violent measures. It is only recently that such traditional conflicts have been aggravated by the negative ecological impacts of poor or inappropriate development practices in the rural sector throughout the developing world. Both environmental discrimination against identity groups and the availability of modern small arms have made these conflicts even more brutal (see case studies by Baechler 1996; Klötzli 1996; Lume 1996; and Suliman 1996, 1996a).

Table 3.1 - Examples of Ethno-Political Conflicts

Country: Region	Environmental Stress	Parties Involved	Conflict Intensity
Ghana: Northern Region	Sahel drought, land scarcity; overuse of renewables, farmers and livestock breeders	Konkombas, and Nanumbas and allied Dagomba and Gonja (chieftancy areas and non-chieftancy areas)	violent conflict at the threshold of war, underlying traditional land conflict
Niger: arid and semi-arid belt	Sahel drought (1972-74 and 82-84), erratic precipitation patterns, degraded space of living for nomads and livestock breeders	Niger government (and farmers) and Tuareg nomads	protracted violent conflict and periods of war
Rwanda	Overuse of land, soil erosion, deforestation, subsistence crisis (farmer and stock holders), high population density	former Bahutu government and invading FPR Batutsi rebels and political opposition	War, massacres and genocide
Sudan: Jebel Marra in Darfur	Sahel drought, desertification, regional overgrazing, land tenure and land use conflict	Fur farmers and Arab nomads, third party interventions (Sudanese government/Libya)	periods of war, skirmishes and violent conflict

Source: Baechler, 1998

3.3.2 Migration Conflicts

Migration conflicts described in this section are either based on internal migration, cross-border migration or have a strong demographic component. Internal migration conflicts are triggered by either 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). Its direction leads from depressed areas to more favourable zones such as fertile rural or (peri-) urban areas. Although both push and pull factors work together, here the push factors are stronger. Forced displacement and expulsion, on the other hand, are due almost entirely to push factors which often appear in connection with large (agro-) industrial, forestry, mining, and dam projects.

Inter-regional migration and displacement - as a special type of internal dislocation - pit people of the same ethnicity from different regions against each other. The most important fault lines are those between highlanders and lowlanders, pastoralists and farmers, rural and urban populations. Mountaineers for instance, drawn downwards by the quest for jobs, income, and land get caught in competitive situations with indigenous populations. The distinct society-nature relationship of newcomers and settled populations triggers tensions, clashes, and in some cases violent conflicts.

Thus a myriad of social interactions emerge. In locally overpopulated and degraded mountain regions with nomadic cultures and few off-farm opportunities, environmental stress prompts major migration waves into irrigated areas and into the urban fringe with resident farming cultures. Integration of former livestock breeders is difficult in large irrigated areas with monocultures (e.g. Himalayan pastoralists in the plains of Central Asia). On the other hand, farmers also migrate from eroded highlands into fertile valleys settled by semi-nomads (e.g. in the Horn of Africa). Thirdly, conflicts emerge if semi-nomadic pastoralists flee from persistent drought and soil erosion to semi-arid and subtropical mountain regions settled by farmers (e.g. in Sudan).

The basic patterns of the three systems of interaction between highland and lowland residents are comparable. Inter-regional migration conflicts are in part determined - as are the other conflict types discussed here - by environmental discrimination against actors who are heavily dependent on scarce natural resources. A second factor of significant influence is poor state performance in marginal areas. High dependence on natural capital combined with poor state performance are two main reasons why discriminated groups are attracted to rich rural areas and country capitals. These two factors are critical in countries with great regional disparities not offset by the rule of law and democratic mechanisms. However, poor state performance is also an inhibiting factor for large-scale migratory movements, namely in cases where poor state performance coincides with illegitimate and oppressive regimes which have been able to put vast territories under military control (see case studies by Faath 1996; Schoenenberg 1996; Smil 1996; and Melber 1996).

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. Even though the term ”environmental refugee” is rejected by the United Nations High Commissioner for Refugees (UNHCR), the linkages between migration and environmental discrimination have been acknowledged by UNHCR head Sadako Ogata (Ogata 1994). UNHCR is concerned with environmental disruption as a serious consequence of large refugee movements (mainly in large camps depending on fuelwood). However, transformation of the environment is itself a reason for migration and flight. Migrations channelled by environmental discrimination intensify conflicts where the economic situation is eroding and political instability deepens lines of conflict. The use of violence in some cases opens pre-colonial divisions between rival identity groups.

Migration resulting in part from environmental stress normally takes the form of a slow infiltration over a long period of time. People move into areas which either permit survival or provide favourable living conditions. Only in exceptional situations such as acute drought do massive flights occur spontaneously. The escape routes are diversified. In many regions, it is more convenient to cross the national frontier because more favourable

foreign destinations lie geographically nearer than the remote capital of one's native country. Frustration and despair can explode into violence in host countries or transboundary regions populated by hostile identity groups or by earlier migrants from common identity groups who show hostile behaviour toward the newcomers. Occasionally the routes also lead to northern industrialised countries.

The following key factors are relevant to both internal migration and displacement as well as cross-border migration and flight.

3.3.2.1 Consequences of Poverty and Poor State Performance

As mentioned above, the largest proportion of populations in developing countries settle in rural areas. Some poverty clusters suffer not only from environmental discrimination but also from insufficient infrastructure, unclear or competing land ownership, subdivision of already small plots, and lack of credit. Phenomena as varied as soil erosion, flooding, drought, salinisation, deforestation, and overgrazing of savannahs accelerate the dissolution of traditional living orders. Such living orders include specific ensembles of economy, culture, neighbourhood, and kinship groups (families, lineage, and clans). Reaching a point of no return, people have no choice but to give up their homestead. At the same time market economies absorb only a few rural dwellers being drawn out of their traditional environment. The market induces a highly selective dissolution of traditional structures. Thus landscape degradation belongs to the very transformation that has produced most of the migrants and refugees leaving their degraded environment to date.

3.3.2.2 Consequences of Modernisation

Problems of modernisation include mechanised farming, forestry, mining, and urbanisation. The various side-effects of these activities - such as a total loss of land, the use of fertilisers, salinisation, and pollution - urge rural dwellers or indigenous peoples to withdraw. They have in fact only two alternatives: either move to more marginal lands and clear them, or join the marginalised in (peri) urban areas. Shrinking lakes (Aral Sea and Lake Chad), flooding, irrigation, loss of biodiversity and the spread of epidemic diseases force resettlement, expulsion, and escape.

3.3.2.3 Consequences of the Location of Population Growth

Due to population growth, the building and settling in marginal areas creates more potential victims of natural events (such as landslides, flooding, earthquakes, and volcanic eruptions). These perils are incorrectly perceived as simply "natural catastrophes" and do not address the catastrophic social consequences.

A conflict-prone situation of importance is intercontinental migration from southern to northern continents. Along the North-South fault lines, industrialised countries are trying to stop the entry of illegal immigrants and to facilitate their return. Some of the migrants come from areas suffering environmental stress and can be viewed as victims of a global resource distribution conflict. As a rule, however, refugees from environmental stress lack the necessary resources and health for long and costly trips. For this reason, the destinations of most migrants and refugees commonly lie close to home. If one pursues the route of a migrant from his homestead to his possible destination in an industrialised country, conflicts occur at various stops along the way: in neighbouring ecological regions, in the national capital, in the arena just across the national border, in third countries, and only in few cases in other continents. Various obstacles represent significant inhibiting factors for large-scale and long-distance migration (see case studies by Faath 1996; Baechler 1994; Gallagher 1994; Ogata 1994; Suhrke 1994).

Table 3.2 - Examples of Migration Conflicts

Country: Region	Environmental Stress	Parties Involved	Conflict Intensity
Algeria: Southern Algeria and Mali and Niger	erratic rainfall, unusual drought (desertification), local overuse of land and water resources	central government and Tuareg immigrants to Wilayat Tamanrasset and Illizi	violent conflict: low-intensity, skirmishes, criminal violence
Brazil: Tocantins River Basin	impoverishment of rural space of living caused by Tucurui hydro-electric plant	local ribeirinhos and immigrants, rural exodus	20 years of protracted conflict with violent social and ethno-political clashes
Namibia: Ovamboland	high population pressure and crisis of subsistence, regional overuse of fertile and marginal land	migrants (small scale peasants) and urban population (axis Oshakati-Ongwediva-Ondangwa)	no violent conflict but growing social tensions along the (semi-)urban axis
China: Northern Henan Province	long-distance migration ("environmental refugees"), high population pressure, loss of arable land through flood/drought	local rural producers and immigrants and displaced people	no violent conflict, but high risk of exacerbating ancient regional, provincial, ethnic animosities

Source: Baechler 1998

3.3.3 Demographically Caused Migration Conflicts

High population pressure in eco-region of low productivity causes either local conflicts or migration which, can in turn, lead to conflicts in the area of destination.

Demographic developments matter for environmental migration conflicts in three different ways: population scale in relation to resources available (density), population growth rate, and resource redistribution through migration and displacement. It is difficult to highlight the causal linkage among population pressure, environmental stress and violence. Yet in a few cases (Rwanda, Bangladesh/Assam, and Indonesia/Java), ample evidence suggests that such connections exist.

The repeated subdivision of land in smaller inheritance shares is an indicator for these connections. Fragmented arable land, decreasing yields per hectare, and a lack of off-farm alternatives coerce large parts of the rural population to migrate toward urban areas where there increasingly raises the potential incidence of conflict concerning both land use and distribution in

Table 3.3 - Demographically Caused Migration Conflicts

Country: Region	Environmental Stress	Parties Involved	Conflict Intensity
Bangladesh and India: Assam Province	Population pressure, subsistence crisis, "environmental refugees" and land degradation	Assam government, local people and Bengali immigrants	Violent conflict, low-intensity, social and ethno-political clashes
Bangladesh: Chittagong Hill tract	Population pressure, competition over land, subsistence crisis, displacement causing land degradation and deforestation	Central government and "Shanti Bahini" (Chakmas)	Guerrilla war, counter-insurgency, ethnic clashes
Indonesia: Java	Population pressure on land: degradation, subsistence crisis, displacement (transmigrasi)	Central government and indigenous people (Irian Jaya)	No violent conflict, but growing social and political (regionalist) tensions
Mexico: Chiapas	Degraded space of living for indigenous people	Mexican government and Zapatistas (EZLN)	Violent conflict, massacres in December 1997

Source: Baechler 1998

growing peri-urban areas as well as concerning the environmental decline in mega-cities (Girardet 1996).

Another indicator of demographically influenced migration is the clearing and cultivation of new land in remote mountains, in deltas, and in ecologically sensitive coastal areas. Landless people and semi-nomads gradually move into protected zones in urban areas or into national parks. Social unrest can recur as these movements provoke clashes with military forces, paramilitary forces or law enforcement agencies and contribute to conflict (e.g. the Maasai in Kenya and in Tanzania). Crisis occurs if the discrimination is perceived as significant by the affected actors. The threshold of when discrimination begins depends greatly upon perception and varies from case to case. Generally speaking, discrimination in particular is perceived to be unacceptable when social or ethno-political factors accumulate, facilitating group identity building (e.g. between Bengali immigrants and residents of Assam province in India).

Population dynamics accelerate the impact of other key factors such as poverty, inadequate land use and land tenure systems, environmental transformation, and poor state performance. This combination of factors

encourages cross-border migration which - in the context of violent coups and civil wars - assumes the form of mass flight, e.g. in the Great Lakes region of Africa (see case studies by Hafiz/Islam 1996; Ehrensperger 1993).

3.3.4 International Resource Conflicts

International resource conflicts are characterised by distribution problems. They are caused by an asymmetrical dependence on the quantity and quality of a resource (i.e. fresh and coastal waters or fish stocks). The likelihood of violent escalation of international resource conflicts depends heavily on the specific combination of contextual factors. Under favourable contextual factors, these conflicts may be resolved co-operatively.

International river basins are the most obvious example for the general contradiction between eco-regional boundaries and state borders. The asymmetric dependence of upper and lower riparians on an international river can significantly raise the potential incidence or escalation of conflict. Lower riparians tend to be more vulnerable than upper riparians.

River pollution and water distribution conflicts are distinct shared resource problems. Pollution conflicts are over an indivisible public good which affects the degree of pollution, the political responsibilities, and the economic costs. Since neighbouring riparians have a vested interest in solving pollution problems co-operatively - in win-win solutions - such conflicts are easier to resolve than those over access to the resource per se. Distribution conflicts turn out to be conflicts over divisible public goods. They are perceived as zero sum games. Discriminatory access to scarce water resources affects national sovereignty and integrity more directly than pollution issues. Both pollution and distribution can obviously appear in combined forms which complicates the search for co-operative solutions.

International conflicts over water use develop in the context of strong riparian interest in securing access to the shared water resources, of asymmetric power distribution among riparians, and of the quality of multilateral relations in general. Conflict dynamics also depend on climatic and geographical conditions, population growth, the economic structure, and the state's ability to cope with vulnerability. Therefore, in addition to given hydrologic conditions, the political and socio-economic milieu is of central importance for settling international water conflicts. There is no direct linkage between water pollution and distribution and the intensity of conflicts; it is mostly the political context that matters.

In regions that suffer from seasonal drought if not from permanent water crises (e.g. the Middle East), distribution and discrimination are highly sensitive issues which are treated as threats to national security. When water flow can be manipulated by the riparians of a shared basin, scarcity conflicts in crisis-prone regions inevitably get mingled with other contributing factors. However, the example of the Arab-Israeli peace process demonstrates that negotiations concerning water management are possible even under conditions where there is acute environmental stress and a protracted conflict. This process was possible because political actors perceived that a regional solution to the water crisis was necessary. However, water talks can easily be cancelled if and when the political situation changes.

There is no guarantee that these conflicts will not escalate or become violent. There have been no wars caused by water distribution issues alone to date. Even in arid zones where states are extremely dependent on external water resources (Egypt), there has been a balance, albeit a precarious one, between threat and co-operation. The geographic course of a river is a power factor worthy of attention.

Within the context of institutionalised and co-operative relations, power relationships are mediated by legal barriers and rules of behaviour derived from custom. The best case scenario for avoiding the escalation of water distribution and pollution conflicts are regimes which focus on contemporary situations. Therefore, water conflicts in and between developed countries tend to be settled by peaceful means, due in part to the parties' significant experience and capability in negotiation and existing regulatory mechanisms at the policy level (e.g. the dispute settlement capacities of the Rhine Commission in Western Europe). Environmental conflicts can become a catalyst for co-operation if political compromises are seen as desirable and technical solutions as feasible. Successful compromises or even institutionalised mechanisms of dispute settlement reduce the danger of water-use conflicts escalating out of control.

Table 3.4 – Examples of International Resource Conflicts

Country: Region	Environmental Stress	Parties Involved	Conflict Intensity
Bangladesh and India: Ganges River Basin	Farakka Barrage on the Ganges River: upstream-downstream conflict, flood and drought	Bengali Govt. and Indian Govt.	No violent conflict, asymmetry between big and small player, political tensions
Central Asia: Aral Sea Basin	Shrinking Aral because of irrigation for cotton, soil erosion (salinisation) and fresh water scarcity	Uzbek Govt. and Kazakh and Turkmen Govt. and local population	No violent conflict, threat of secession of Karakalpakia from Uzbekistan
Central Asia: Fergana Valley	Shared irrigation systems: withdrawal from tributaries to Fergana Valley	Uzbek and Tajik population	Violent conflict: ethnic clashes, high tension
Lake Chad Basin	Shrinking Lake Chad, persistent drought, high evaporation, subsistence crisis, immigrants from Nigeria	Nigerian Govt., Cameroonian and Chadian government	No violent conflict, but tensions: water regime is disputed (there is a Basin Commission)
Middle East: Jordan River Basin, Gaza Strip	Absolute distribution conflict: water scarcity and drought threatening small-scale farming	Israeli Government, Syrian and Jordanian Governments and Palestinians (Gaza)	No violent conflict but high regional tensions
Northeastern Africa and wider Horn: Nile Basin	Upstream-downstream conflict, absolute distribution conflict in a drought prone area depending on agriculture	Governments of Zaire, Rwanda, Uganda, Kenya, Sudan, Ethiopia and Egypt involved	No violent conflict, but high regional tensions as part of major historical conflicts in the wider Horn
Senegal Mauritania: Senegal River Valley	Dam project (OMVS) against persistent drought, desertification, expulsion of black-farmers by Mauritania	Mauritanian government (Moors as white elite) and Senegalese government and black small-scale farmers	Violent conflict in 1989, transboundary fights between troops on both sides

Source: Baechler 1998

There are other encouraging examples of long-standing co-operation on international rivers despite conflict. One example is the Nile Agreement between Egypt and Sudan from 1959, which has been respected despite several incidents of acute tensions (there are current efforts strengthen co-operation among all ten Nile riparians, supported by the World Bank and UNDP). A second example is the co-operation among Thailand, Cambodia, Laos and Vietnam in the Interim Mekong Committee since the 1950s, and since 1995 in the Mekong River Commission (MRC). Although China is not part of the MRC, the hydropower dams currently being built in China on the upper Mekong will actually have a positive impact on downstream riparians by regularising the water flow without reducing the total flow. Despite this, an atmosphere of distrust surrounds these dams, not because of an actual resource conflict, but because of the lack of willingness on the Chinese side to exchange data and to accept the principle of limited sovereignty over rivers originating in its territory.

Water issues can become a potential trigger for conflict under a particular set of highly negative contextual factors (e.g. between Israel and Syria in the prelude to the Six Day War). The asymmetrical geographic positions in the basin then come into play as the upper riparian puts pressure on highly vulnerable neighbours. If dominant riparians turn out to be authoritarian regimes with poor state performance, water issues may further delegitimise the central governments in the eyes of discriminated group especially if they are highly dependent on water for agriculture. On the Indian subcontinent, river basin conflicts are imbedded in the context of extreme poverty, ethno-political schisms, and the hegemonic demands of a regional power. These factors strongly influenced socio-political conflicts with the lower riparian, Bangladesh and between Bengali migrants and inhabitants of the Indian Province Assam (see case studies by Baechler et al. 1996: 117-166; Gleick 1996; Hafız/Islam 1996; Klötzli 1996; Libiszewski 1996; Okoh 1996; Rogers 1996; Thomas 1996; Wegemund 1996; Baechler 1997; Durth 1993).

3.3.5 Environmental Conflicts due to Global Environmental Change

The development of global environmental conflicts or, specific statements about the socio-economic and ecological effects of climate change were not observed as a direct cause of conflict. However, climate change is a form of environmental stress which overtime, may demonstrate the globalisation of environmental transformation to be a process that raises the potential incidence of future conflict (Myers 1993; Renner 1996). Recent research results reveal that the effects depend to a large extent on the regions and sectors analysed (Dutch National Research Programme 1996: 118). There may be sectors and regions which would benefit from a temperature rise, but there will be sectors and regions of the world highly affected by the consequences of climate change. For example sea level rise in the Pacific will causes a larger number of coastal zone residents to migrate or flee to another, potentially also environmentally-sensitive region. The same holds true for drought due to changes of precipitation patterns, resulting in population movements in the arid and semi-arid regions of the world. Thus, even if there are no testable consequences on conflict behaviour at the moment, the future effects of global environmental stress such as climate change has to be anticipated and understood as potential effect on international stability.

As the Intergovernmental Panel on Climate Change (IPCC) has analysed in its recent work on assessing regional effects of climate change, climate change will have serious impacts on socio-economic well-being in certain regions of the world. IPCC predicts additional stress on already degraded resources, increasing demand, unsustainable management practices which will finally "reduce the ability of some environmental systems to provide, on a sustainable basis, key goods and services needed for successful economic and social development." (IPCC 1997: 3). Environmental stress resulting from climate change is likely to be a major concern for the future.

These consequences of global environmental change will occur especially in the developing world. In regions where institutional and market factors can for example balance losses in food production through storage of surpluses or food imports, the vulnerability to the effects of climate change is low. Where these mechanisms are

lacking, effects can cause serious socio-economic consequences and raise the potential incidence of conflict. Due to the effects of development, the victims of global environmental transformation will be found where environmental discrimination has already provoked a precarious situation. If current conflicts can be traced back to global environmental phenomena, they presumably concern mainly domestic ethno-political or internal migration conflicts. Climate change, as an element of environmental stress, influences the potential collapse of rural structures and regional political authorities. According to the IPCC, industrialised countries will be better prepared to adapt to the environmental and socio-economic consequences of climate change through technological and environmental management capacities, while in many developing countries these mechanism are lacking (IPCC 1997: 8). In its regional assessment IPCC concludes that industrialised countries generally will not be affected as much as developing countries by the effects of climate change, due to existing response capabilities. Industrialised countries are for the moment capable of managing potential effects, while in regions with unfavourable geographical and socio-economic conditions such as parts of Latin America or Oceania these changes might contribute to conflict (IPCC 1997: 14).

Global environmental conflicts may have a North-South dimension as the environmental stress is caused largely by industrial production and consumption patterns in the North while the South suffers most from the effects of this action. International concerns, such as the global campaign of the Small Island States indicate that there is potential for future conflict between North and South. This line of reasoning requires the serious analysis of environmental stress and its impact upon the potential incidence and escalation of environmental conflicts in the developing world by the industrialised countries at the earliest possible point of time.

Integrated Risk Assessment 4

Key Findings

- *The nature of the relationship between environmental stress and security is indirect and multi-causal. Environmental stress can be prioritised according to time of impact, geographic area affected and magnitude of stress.*
- *The consequences of environmental stress (political, economic, social and demographic) tend to be highly interrelated 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.*

4.1 Introduction

The task of the chapter on integrated risk assessment is to establish guidelines for assessing and prioritising the potential impact of different types of environmental change on security. The risk assessment is termed integrated because of the broad range of factors (political, economic, social, demographic and environmental) that are considered in performing the analysis. The risk that is being assessed is the risk of increasing the potential incidence or escalation of conflict. 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.

Conflict is one part of a potential spectrum of outcomes and furthermore, cases resulting in violence are a small subset of the total number of cases where conflict occurs. The emphasis on the incidence or escalation of conflict is not meant to suggest that these are a preponderance of the cases, but rather, these cases, because of their potential consequences, traditionally receive more attention and thus become the cases of interest.

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

The integrated risk assessment must examine not only the relationship between environmental stress and its consequences, but also how the consequences of environmental stress may influence each other and how that interaction effects the potential incidence or escalation of conflict. The integrated approach, which is more complex, should provide a more in-depth analysis and is also more likely to indicate areas for policy intervention or opportunities to leverage current resources in such as way as to reduce the potential incidence or escalation of conflict.

4.2 Methodology

4.2.1 Non-Linearity and Complex Adaptive Systems

The integrated risk assessment is based on the assumption that the relationship between environment and security is largely a non-linear relationship. In assuming that the relationship is non-linear, the integrated risk assessment can more accurately portray the nature of the relationships under examination and is able to account for differing outcomes in cases where the environmental stress is very similar, both in terms of its character and its magnitude. Non-linear relationships and complex adaptive systems (an integrated group of non-linear relationships) address the underlying interactions of numerous factors which may have a disproportionate influence upon the relationship between environmental stress and the potential incidence or escalation of conflict. This would account for minor changes in contextual factors having a significant impact on the development of conflict or the outbreak of violence.

Through the property of aggregation in complex adaptive systems, the integrated risk assessment is better able to account for the interaction within and among natural resource systems which are subsumed in analysing the larger systems of interest. The typology of cases developed in Chapter 3 demonstrates that very similar cases of environmental stress do not necessarily result in the same outcome, notably the conflict or the outbreak of violence. The model of the relationship between environmental change and security recognises the importance of subtle differences through the inclusion of contextual factors which may have a profound effect upon the potential incidence or escalation of conflict. For instance, cases involving subnational groups show different patterns of behaviour than in cases involving two nation-states indicating structural differences as analysts begin to change scales.

The model in Chapter 2 of the relationship between environmental change and security is a complex adaptive system. Though the relationship between environmental change and security is non-linear, the paucity of non-linear analytical tools makes it necessary to engage in reductionist analysis in order to make the integrated risk assessment practical. As such an integrated risk assessment consists of three basic tasks. The first is to determine the incidences of environmental stress. The second is to determine the nature and strength of the consequences of environmental stress. The final task is to examine the effects of those consequences on the potential incidence or escalation of conflict.

4.2.2 Assessing the Incidence of Environmental Stress

In Chapter 2, we define environmental change as 'environmental stress' as a term that characterises both quantitative and qualitative changes in renewable natural resources. Environmental stress occurs when demands on the renewable resource system exceed the available quality or quantity of resources at a certain period of time. These periods in time correlate with points along the natural resource system cycle and the degree of variability within the natural resource system. At this point, qualitative and quantitative changes become indistinguishable as both are reduced to questions of available supply. Quantitative factors can be expressed as the total amount of a particular resource, such as arable land. Qualitative factors can also be expressed in terms of supply by the existence of a particular sub-component, such as the amount of nitrogen in the soil in question. Increasing demands for a specific resource will increase the points in the system

cycle where demand may exceed supply. The same results may occur if inputs to the system are reduced or if certain sub-systems are removed from the overall system. The development of threshold values (see Chapter 5) can help to establish the potential or actual occurrence of environmental stress and provide policy makers with a benchmark against which to assess environmental changes.

After identifying the existence of environmental stress, the integrated risk assessment should prioritise the incidence of stress. Incidences of environmental stress that occur in the short term over alarge geographic area and engender more severe changes will require more immediate attention and resources than those incidences of stress which are not as severe, occur in a relatively confined area and will not impact for some years.

4.2.3 Determining the Consequences of Environmental Stress

In most cases, the existence of environmental stress will generate political, economic, social and demographic consequences. The integrated risk assessment needs to determine the existence and significance of each type of consequence in order to assess its impact on the potential incidence or escalation of conflict. While the integrated risk assessment should recognise the existence of a broad range of consequences, it is more important to determine which consequences are the most significant.

Determining the significance of the consequences of environmental stress is highly dependent upon the contextual factors. The contextual factors impact on the consequences of environmental stress by creating the conditions to enhance or restrict the development of the consequences. A positive set of contextual factors will be able to reduce the effects of the consequences or remove the factors which generated the stress in the first place. Consequently, a negative set of contextual factors will create the conditions for the consequences of environmental stress to grow and have a greater impact on the potential incidence or escalation of conflict. The integrated risk assessment needs to assess the strength of each of the contextual factors (listed in Chapter 2) to determine which consequences of environmental stress are more likely to increase the potential incidence or escalation of conflict.

4.2.4 Assessing the Potential Incidence or Escalation of Conflict

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. Using a set of pre-established patterns of interactions, called syndromes, can help to control for complexity in the integrated risk assessment. One existing approach available is the Syndrome Approach developed by the German Government's Advisory Council on Global Change (WBGU) and the Potsdam Institute for Climate Impact Research (PIK). The approach is regarded as fruitful for the analysis of complex interdependent human-nature relationships. It is used by a number of researchers in the field of environment and conflict with success as a concept, which is able to most closely approximate the complex relationship between socio-economic and natural factors (WBGU 1994, 1995, 1996, 1997, 1998).

4.3 The Syndrome Approach

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 policy makers. 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 policy makers is that it may serve as a promising starting point for the development of indicators for early intervention in the conflict dynamic and may provide the opportunity to reduce the popotential incidence of conflict or its escalation in specific cases. There are sixteen syndromes (see Table 4.1) almost all of which are experimental hypotheses and are divided into the three subgroups 'resource use', 'development', and 'sinks' (WBGU 1996).

The Sahel Syndrome

This syndrome can be attributed to a variety of complex factors causing environmental stress when the ecological carrying capacity is exceeded in regions where natural environmental conditions (climate, soil) restrict agricultural use (marginal locations) (Schellnhuber et al. 1997; WBGU 1997). Typical symptoms of this syndrome include soil degradation, desertification, destabilisation of ecosystems, loss of biodiversity, threats to food security, marginalisation, and rural exodus. This syndrome

Table 4.1 - Overview of Global Change Syndromes

Utilisation Syndromes	
1. **Sahel Syndrome**	Overcultivation of marginal land
2. **Overexploitation Syndrome**	Overexploitation of natural ecosystems
3. **Rural Exodus Syndrome**	Environmental degradation through abandonment of traditional agricultural practices
4. **Dust Bowl Syndrome**	Non-sustainable agro-industrial use of soils and bodies of water
5. **Katanga Syndrome**	Environmental degradation through the extraction of non-renewable resources
6. **Mass Tourism Syndrome**	Development and destruction of nature for recreational ends
7. **Scorched Earth Syndrome**	Environmental destruction through war and military action
Development Syndromes	
8. **Aral Sea Syndrome**	Environmental damage of natural landscapes as a result of large-scale projects
9. **Green Revolution Syndrome**	Environmental degradation through the introduction of inappropriate farming methods
10. **Asian Tigers Syndrome**	Disregard for environmental standards in the course of rapid economic growth
11. **Favela Syndrome**	Environmental degradation through uncontrolled urban growth
12. **Urban Sprawl Syndrome**	Destruction of landscapes through planned expansion of urban infrastructures
13. **Major Accident Syndrome**	Singular anthropogenic environmental disasters with long-term impacts
Sink Syndromes	
14. **Smokestack Syndrome**	Environmental degradation through large-scale diffusion of long-lived substances
15. **Waste Dumping Syndrome**	Environmental degradation through controlled and uncontrolled disposal of waste
16. **Contaminated Land Syndrome**	Local contamination of environmental assets at industrial locations

typically appears in subsistence economies where groups of rural poor and sections of the population threatened with marginalisation are confronted with increasing degradation of their natural environment due to an overexploitation of agricultural land. For example, in the Sahel zone itself more than half the population is threatened by starvation following destabilisation of rural production and social systems.

Overexploitation Syndrome

This syndrome involves the conversion of natural ecosystems and the overexploitation of biological resources, and affects both terrestrial and marine ecosystems. Ecosystems are overexploited for a short-term gain beyond their regenerative capacity resulting in habitat and biodiversity loss, climate change, fresh water scarcity, soil erosion, increasing incidence of natural disasters, and threats to food security. This syndrome is evident in the following areas: tropical rainforests (Brazil, Malaysia); mangroves in tidal zones of tropical coasts (Myanmar); boreal forests (Siberia); and the major fishing grounds of the world's oceans (Note: 13 of 17 major fishing grounds are being over-fished beyond their natural carrying capacity).

Rural Exodus Syndrome

This syndrome refers to environmental stress caused by abandonment of previously sustainable land-use practices. As socio-economic conditions continue to be driven by the global market place, labour intensive methods for cultivation become increasingly unprofitable and jeopardise subsistence farming. As a result, many agrarian young males migrate to urban area for better services and higher wages. This syndrome is applicable to various regions with labour-intensive wet rice terraces on steep slopes (e.g. in northern Luzon, Philippines) and in the fertile slopes of Mt. Kilimanjaro as well as in northern Pakistan.

Dust Bowl Syndrome

This syndrome is a specific causal complex in which environmental destruction is caused by non-sustainable use of soils, bodies of water as biomass production factors, involving intensive deployment of energy, capital and technology. The resulting symptoms include lack of available biomass, loss of ecosystem and species productivity, genetic erosion, eutrophication, acid rain, greenhouse effect, contamination of water bodies and air, freshwater scarcity, soil degradation, marginalisation, and rural exodus. The syndrome can be observed in the global marketplace whereby competition is greatly distorted by trade barriers and there is inadequate internalisation of environmental impacts leading to the Dust Bowl syndrome.

Katanga Syndrome

This syndrome includes the environmental stress (sometimes irreversible) caused by intensive mining of non-renewable resources above and below the ground, with no consideration given to preservation of the natural environment. The resulting symptoms include biodiversity loss, local air pollution, freshwater scarcity, change in runoff, water pollution, soil degradation, creation of contaminated sites, and negative effects on health due to pollution. The major hotspots for this syndrome include the following: Irian Jaya in Indonesia, Carajás in Brazil, Bougainville in Papua-New Guinea and Katanga. Oil production is also included where environmental degradation is evident, including Nigeria, the Gulf States, and Russia.

Mass Tourism Syndrome

This syndrome describes the network causes and effects generated by the steady growth of global tourism leading to major environmental degradation in certain regions of the world. Hotspots generally include those coastal and mountainous regions where mass tourism has contributed to loss of biodiversity, enhancement of the greenhouse effect by air travel, lack of freshwater

supply, soil erosion, inadequate disposal of sewage and waste, fragmentation of landscapes by settlements, and high consumption of resources. Typical examples are the overdevelopment of previously semi-natural areas in Spain (Costa del Sol, Lanzarote) and the consequences of trekking tourism in Nepal.

Scorched Earth Syndrome

This syndrome is attributed to the environmental degradation resulting from the direct and indirect impacts of military activities (manoeuvres, regionally confined military operations, and contaminated military sites). The resulting symptoms include a loss of biodiversity, permanent soil degradation due to mines and unexploded ordinance, soil and groundwater contamination caused by fuels and explosives, health hazards, and greater flows of refugees. Results of this syndrome can be applied to areas historically impacted by or related to the Cold-War or in regions where military activities are threatening the environment.

Aral Sea Syndrome

This syndrome describes the impact of large-scale or extensive reshaping of semi-natural areas (WBGU 1998). Entire landscapes are deliberately and systematically affected by major capital intensive projects without consideration of local conditions (construction of dams or irrigation systems). The resulting symptoms include a loss of biodiversity, local or even global climate change, shortage of freshwater, soil degradation, forced resettlement of the local population, and tensions among riparians. Other examples of this syndrome include large-scale dam projects (e.g. the Hoover, Aswan, Narmada and Bakun Dams or the Three Gorges project on the Yang Tse).

Green Revolution Syndrome

This syndrome is the result of a centrally planned modernisation of agriculture whereby agricultural technology is imported to secure an adequate food supply for a rapidly growing population. However this production has negative impacts on both the natural basis for production and the social structure and leads to the following symptoms: loss of biodiversity, genetic erosion, groundwater pollution, soil degradation, threats to food security, health hazards through pesticide use, marginalisation, rural exodus, reduction of cultural diversity, reinforcement of regional economic disparities. A key example of this syndrome occurred in India in the 1960s in large delta regions of the Ganges, Cauvery, and Indus rivers.

Asian Tigers Syndrome

Today we are witnessing in many regions of the world, especially in the "newly industrialising states," rapid economic growth and structural transformation over a short-period. These regions are experiencing a new kind of intensity and momentum that has negative effects on both the environment (absence of environmental technologies, enhanced greenhouse effects, local climate change, smog, acid rain, water pollution, health hazards, high consumption of resources) and on people (low wages, lack of employee participation rights and initially lower standards of consumption). This syndrome applies to all countries trying to imitate the Asian Tigers such as those in Southeast Asia, India, Central and South America and South Africa.

Favela Syndrome

This syndrome generally refers to a process of unplanned, informal and environmentally harmful urbanisation whereby large pockets of poverty (slums and shantytowns) are evident in marginal peripheral areas of the world's "mega-cities". When population growth and rural-urban migration are uncontrolled, it leads to many of this syndrome's symptoms: air pollution, soil erosion, accumulation of waste, noise, population growth, rural exodus, acute health hazards, socio-economic marginalisation, failure of public administration, lack of basic infrastructure, and overloaded traffic infrastructure. Examples include such "mega-cities" as Karachi, Cairo, Sao Paulo, Mexico City, Calcutta, Manila, and Teheran.

Urban Sprawl Syndrome

This process refers to urban expansion with far-reaching environmental impacts. The formation of urban agglomerations (suburbia or exurbia) leads to new spatial structures emanating from cities while converting the natural landscape creating new symptoms such as: fragmentation of ecosystems, near-surface ozone contamination, stratospheric ozone depletion, urban air pollution, enhanced greenhouse effect, acid rain, soil contamination, compaction surface sealing, health hazards, and traffic congestion. The syndrome can be identified in areas experiencing uncontrolled urbanisation, especially across the various cities and regions in the USA.

Major Accident Syndrome

The central feature of this syndrome is when localised disasters caused by humans have grave transboundary effects and there is generally limited or inadequate liability for the resulting environmental damage. Well-known incidents include the Chernobyl nuclear explosion, the Exxon Valdez oil spill, and the Bhopal disaster. The aftermath of these accidents lead to large-scale biodiversity loss, ecosystem degradation, contamination of soil, water and air, and health hazards. This syndrome also applies to the introduction of non-indigenous species via ocean-going transportation leading to destruction of habitats through massive reproduction of invasive species, ecosystem degradation, and extinction of indigenous species. The best-known example is the importing of rabbits to Australia where growth of the rabbit population ravaged the local habitat and eventually lead to a devastating plague.

Smokestack Syndrome

This syndrome describes the remote effects of substance emissions following disposal on the environmental media (water and air). Environmental impacts are distinguished by whether the pollutants have effects on the system after dispersal in the environment (e.g. ozone depletion caused by CFCs, enhance greenhouse effect due to CO2 emissions) or whether they re-accumulate (acid enrichment in soils resulting from emission of NH3 SO2 and NOx, accumulation of persistent pesticides in the food chain). The overall symptoms of this syndrome include: loss of biodiversity, eutrophication of eco-systems, depletion of the stratospheric ozone layer, increased levels of UV-B radiation falling on the Earth's surface, enhancement of the greenhouse effect, regional and global climate change, sealevel rise, acid rain, contamination of soils and ground water with impacts on drinking water sources. This syndrome, for example, can be seen in Central Europe with rapid forest decline.

Waste Dumping Syndrome

This syndrome describes the growing need world-wide for controlled disposal of residual and waste matter. This syndrome involves the localisation, compaction, and accumulation of waste in small-scale facilities. However the problem is that no one knows the precise lifetime of such waste systems as far as liquid or volatile pollutants are concerned. Additionally landfills can lead to contamination of soils and groundwater leading to harmful effects on drinking water and health hazards. For example, in many African settlement areas there are numerous landfill sites which can be described as environmental time-bombs. This syndrome poses a serious hazard in many developing regions.

Contaminated Land Syndrome

This syndrome categorises sites and regions with accumulated deposits of pollutants in soils or underground that pose as a human health and environmental hazard. Symptoms generally include a loss of biodiversity, de posits of pollutant in soils, water and air, and loss of soil functions. Contaminated sites are usually found at agglomerated locations in regions where heavy industrial, commercial, or military activities have occurred. There are numerous examples world-wide including Cubatoa (Brazil), the Donez Basin (Ukraine), Katowice (Poland), Wallonia (Belgium), Manchester-Liverpool-Birmingham (United Kingdom), and Pittsburgh (USA) (WBGU 1997).

4.4 Requirement for an Integrated Risk Assessment

A fully functional integrated risk assessment approach should correlate these syndromes with the potential for conflict. Some preliminary research findings suggest that certain syndromes are more prone than others are to the onset or escalation of conflict. Additional empirical testing in this area is likely to confirm meaningful relationships between particular syndromes and conflict potential. This can be translated into a practical integrated risk assessment tool for policy makers to let them know when, where and how a syndrome might lead to 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 interdependencies in the future.

5 Indicators, Data, and Decision Support Systems

Key Findings

- *Existing research findings in the environment and security field can provide useful direction for the design of early warning indicator systems and decision support systems. Further research is required to specify, focus and simplify research results so that they can be useful directly for policy-makers.*

- *It is recommended that tracking and monitoring 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 to escalate along the conflict continuum. The contextual indicators are critical in forecasting which environmental stresses are likely to produce conflictual outcomes.*

- *To be useful for early warning, indicator systems must provide indication of critical problems and thresholds at very early stages, when it is still possible to avert future instability. Warning indicators generally refer to anticipated environmental stress; contextual factors associated with environmental stress; and, consequences of environmental stress.*

- *It is preferable to focus on indicators that reveal levels of anticipated environmental stress.*

- *When sustainable development indicators are stressed beyond certain thresholds or reference values, they are likely to lead to unsustainable policies and practices 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 systemically 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.*

- *Due to the large number of indicators available, more research is needed to reduce these indicators to a number more manageable for policy support. In order to be useful for policy makers, indicators should be readily understandable and interpretable. There are two approaches to controlling for indicator complexity: development of a single index by statistically or mathematically aggregating multiple indicators; and development of 'marker indicators' through the selection of a small number of indicators from a much larger pool which correlate strongly with particular concepts.*

- *Simple and practical decision support systems can be developed to provide early warning to policy-makers using existing data resources. They should be oriented toward providing early warning of the potential for conflict.*

- *Decision support systems should be capable of evaluating how particular environmental problems are affected by contextual factors that may facilitate or exacerbate their potential impact on the incidence or escalation of conflict. They should be able to provide useful analysis and recommended responses at different stages of the conflict dynamic.*

5.1 Introduction

Much of the research discussed in this Pilot Study suggests that the development of early warning indicator systems, data bases, and decision support systems is feasible and warranted. This chapter presents a set of options, grounded in existing research, that offers practical solutions to support country policy makers. First, it is shown how indicators of environmental stress can provide policy makers and analysts with gauges to measure and assess the situation. Illustrative early warning indicators are presented that offer a potential means of forecasting possible instances of conflict, with some degree of reliability, thus providing the time to act pre-emptively and prevent escalation. Second, the methodological issues of how such indicators are collected and processed, from what sources, with what levels of reliability, and for what geographic areas are presented in a section on data bases and sources. Third, recommendations are made concerning how the decision requirements of policy makers can be satisfied through the development of decision support systems. The basic structure of a simple decision support system is outlined to illustrate how such practical assistance can be formulated.

While the existing research referred to in this chapter is highly indicative of what indicators, data sources and decision support are feasible, we are far from enumerating the particulars of practical systems for policy makers. Rather, the intent of this chapter is to provide illustration, guidance and direction for continued research. Recommendations for such research are also offered.

5.2 Indicators

This section describes several types of indicators that research suggests may provide policy makers with meaningful signals of the potential incidence of conflict. These indicators are derived from three basic sources:

(1) Research and modelling projects concerned with the impact of environmental change on conflict;

(2) Research on sustainable development thresholds that suggest the levels beyond which environmental change will produce instabilities in social, economic and political development, and;

(3) Statistical research across a number of countries that assesses the facilitating or inhibiting role of contextual factors on political, economic and social instabilities in the face of environmental change.

5.2.1 Research and Modelling Projects on Environment and Conflict

The debate concerning the relationship between environment and security examines several competing multidimensional models that seek to explain the conditions under which the consequences of environmental stress impact on the potential incidence of conflict (see Chapter 2 for more details). Each modelling activity employs different sets of indicators to understand which stresses may be credible threats, how one can forecast which consequences of environmental stress are likely to contribute to the incidence of conflict, and which policy responses are most likely to succeed in managing or preventing disputes related to environmental stress. The principal benefit of basing applied indicator systems on such research and modelling projects is that the resulting indicators do not simply have face validity, but are validated by empirical results as well; the proposed indicators do not only represent logical and reasonable categories to be measured, but are supported by analysis and testing.

However, many of the research projects that we can reference for advice on meaningful indicators use qualitative case study research designs and their conclusions have faced extensive criticism on methodological grounds (Gleditsch 1998). Most can be characterised as early research efforts to understand the relationship between environment and security, using case studies to develop research hypotheses that still require further systematic testing. Despite these drawbacks, the existing research findings in this field are significant.

In general, most projects agree that it is important to track and monitor a large number of environmental and contextual indicators to predict the potential incidence of conflict and the potential for existing conflicts to escalate at various points along the conflict continuum. While these projects do not reach a consensus on the specific causal linkages between environmental stress and conflict nor on the critical indicators that explain or predict the potential incidence of conflict, they do go beyond mere speculation by collecting, analysing, and comparing case study evidence.

There are some specific points of agreement: the depletion and degradation of renewable resources, population growth, and the unequal distribution of land and income are often sources of conflict. A recently completed cross-sectional statistical study suggests the further distinction that while environmental degradation and land degradation are more likely to throw countries into civil turmoil (primarily small conflicts), economic and political indicators are far more important as predictors of domestic armed conflict (Hauge and Ellingsen 1998).

The findings of three major research programs and their indicator sets are described below. First, a recent research project at the Georgia Institute of Technology has completed a proposed inventory of the existing research literature on environmental change and conflict, culminating in a very useful table of potential indicators representing environmental pressures, and their physical and social consequences (Goodrich and Brecke 1996). This synthetic meta-analysis of the literature results in an indicator set that suggests useful directions for further investigation of early warning of environmental changes that may lead to conflict (see Table 5.1).

Table 5.1 - Several Indicators Suggested in Goodrich and Brecke 1996

Conceptual Categories	Illustrative Indicator Categories that Suggest Socio-Political-Economic Instabilities
Agricultural land degradation	Change in soil quality
Climate change	Change in air temperature Change in the volume of ice
Deforestation	Change in forest acreage Change in habitat population
Fish stock depletion	Fish population
Coastal erosion / Coastal flooding	Beach recession/Relative sea level
Overuse and pollution of fresh water	Change in groundwater level Evidence of pollution
Damaged infrastructure	Increase in energy rates Increase in river transport traffic
Food shortage	Change in food prices
Lack of satisfactory health and sanitation	Water diseases

Second, a major research program at the University of Toronto and the American Academy of Arts and Sciences (AAAS) (Homer-Dixon and Percival 1996) indicates that environmental scarcity is rarely the sole and direct cause of violent conflict (except in the case of shared river waters where dams or other water-related projects have been known to cause major relocations of peoples that yield violent conflicts and turmoil). On the basis of many detailed case studies, these researchers conclude that critical environmental problems influence conflict indirectly through a string of political-social-economic effects. For example, environmental stress may increase the potential incidence of conflict by causing an economic decline, decreasing agricultural production or increasing population migration, which in turn may, under the proper conditions, generate civil strife, insurgencies, and even state collapse. The triggering environmental

Table 5.2 - Several Indicators Suggested by Homer-Dixon and Percival 1996

Research Findings	Illustrative Indicator Categories that Suggest Socio-Political-Economic Instabilities
Under certain circumstances, scarcities of renewable resources produce civil conflict and instability, but usually environmental scarcitiy acts by generating *social effects,* such as poverty and migration.	1. *Socio-political-economic effects of scarcity:* • Trends in poverty • Trends in population movements • Trends in ethnic, racial or religious hostilities • Capacity of political and social institutions 2. *Situational indicators that mediate between scarcity and conflict:* • Economic system • Level of education • Ethnic/class cleavages • Technological and infrastructural capacity • Legitimacy of the political regime
Environmental scarcity appears to be correlated with three factors: a *reduction in the quality or quantity of a resource, population growth and increased per capita consumption, and inequitable distribution.*	1. *Renewable resource scarcities* • Degradation and depletion of renewable resources • Population growth • Inequitable resource access
The *capture of valuable environmental resources and the migration* of marginal groups to ecologically sensitive areas reinforces environmental scarcity and the potential for social instability.	1. *Changed access to resources* 2. *Population migration to ecologically fragile regions*
Societies can *adapt* to renewable resource scarcities.	1. *More efficient use of environmental resources* 2. *Substitution for scarce resources*
In the *absence of adaption*, environmental scarcity can weaken states and their institutions.	1. *Economic decline* 2. *Increased financial demands on government* 3. *Increased segmentation of societal groups*

factors, and their subsequent effects, are often trans-boundary problems, such as dealing with shared water, land or atmosphere, and cross-border migration of population groups. In particular, the following indicators in Table 5.2 are suggested by their research findings.

Third, another major study, the Environment and Conflicts Project (ENCOP) of the Swiss Peace Foundation in Berne (Baechler, Böge, Klötzli, Libiszewski and Spillmann 1996), links environmental degradation and domestic armed conflict using theories of over- and underdevelopment, consumption, and modernisation (see Table 5.3). These findings reflect hypotheses derived inductively from multiple case analysis, rather than from systematic hypothesis testing.

Table 5.3 - Several Indicators Suggested by Baechler et al. 1996

Research Findings	Illustrative Indicator Categories that Suggest Socio-Political-Economic Instabilities
Environmental discrimination is likely to create the atmosphere for conflict.	1. Limited group access to fresh water 2. Food production per capita
Environmental dependence on degraded renewable resources is an indicator of environmental stress that can lead to conflict.	1. Soil erosion and desertification risk 2. Scarce arable land resources 3. Rural poverty 4. Importation of food vs. Exportation of cash crops 5. Disaggregated Human Development Index
Migration, due to environmental degradation or economic problems, can reinforce these problems over time.	1. Urban population growth rate 2. Regional population density 3. Internally displaced persons 4. Cross-border refugees
Problems such as land degradation or natural disasters can lead to increased *poverty,* especially in agriculturally-dominant societies.	1. Percent of population in poverty 2. Infant mortality rate
Environmental problems may result in *decreased food supply,* that in turn can lead to instabilities.	1 Daily calorie supply per capita 2. Life expectancy at birth
Health problems may result from environmental degradation.	1 Life expectancy at birth 2. Infant mortality rate
If societies experiencing environmental degradation have high levels of *public participation in decision-making*, they are more likely to be able to resolve or prevent conflicts early.	1. Elected multi-party system 2. Participation of groups in environmental affairs
Strong and stable governments are more likely to have the capacity to mitigate the political tensions which arise due to scarce resources.	1. Number of governmental changes 2. Attempts to overthrow the government illegally

Table 5.3 - Several Indicators Suggested by Baechler et al. 1996 (continued)

Research Findings	Illustrative Indicator Categories that Suggest Socio-Political-Economic Instabilities
Societies with *strong institutional and technological capacity* are able to avert conflicts that may result from resource scarcity.	1. Existence of an organised legal system and rule of law 2. Expenditures per capita for the environment, rural development, poverty alleviation, and research and development 3. Implementation of national environmental action plans 4. Membership and participation in international or regional regimes or organisations 5. Adult literacy rate 6. Number of scientists and technicians per 1000 persons 7. Availability of conflict resolution mechanisms in society (legal instruments, regulations, institutions) 8. Regime stability
Countries *experiencing weak economic* performance are more prone to serious conflict when confronted with environmental degradation and scarcity.	1. GNP per capita 2. Purchasing power parity estimates
Social inequality and discrimination against groups in society increases the likelihood that any environmental degradation or scarcities that are experienced will lead to increased social and economic conflicts.	1. Gini index of income distribution 2. Rural-urban disparities in poverty 3. Degree of participation of diverse societal groups in the decision-making process
Population growth and density generally reduce each persons share of scare resources, creating increased environmental stress and potentially resulting in social problems.	1. Annual net population growth rate 2. Percentage of persons by age group 3. Population density per hectare of arable land 4. Rural-urban population distribution

To be truly useful for early warning, indicator systems must provide an indication of critical problems and thresholds before they become manifest – when it is still possible to avert future conflict or instability. Thus, early recognition that environmental change augurs a potential security threat is an essential element of indicator warning. Warning indicators can refer to:

(1) The anticipated environmental stresses. These indicators deal directly with the environmental stresses that can have political, economic, social and demographic consequences.

(2) The contextual factors associated with environmental stress. These indicators deal with contextual factors that can facilitate or inhibit the potential incidence or escalation of conflict. These indicators focus on the socio-political-economic conditions that may aggravate or moderate environmental problems and cause them to escalate or diminish.

(3) The consequences of environmental stress. These indicators are concerned with the downstream security consequences of environmental stresses, that is, how they affect the potential incidence of conflict through political, economic, social, and demographic factors. These indicators, for example, deal with monitoring ethnic unrest and civil strife, rather than with the scientific and technological aspects of the environmental issues.

5.2.2 Sustainable Development Indicators

Since the United Nations Conference on Environment and Development in Rio in 1992, there have been several initiatives which focus on building indicators of sustainable development (Moldan and Billharz 1997; United Nations 1996). While the principal intention of these efforts has been to gain insight into progress made toward achieving the goals and agenda established in Rio, these indicators can also be useful for the Pilot Study (see Table 5.4). In almost all cases, these indicators define environmental factors which, if stressed beyond certain thresholds or reference values, are likely to suggest unsustainability and can be potential contributors to conflict.

What distinguishes significant from trivial environmental changes? Reference values identify the thresholds at which changes over time in environmental indicators, such as those in Table 5.4, are transformed from being beneficial or neutral to being negative, costly, unsafe or risk-provoking along some dimension (World Bank 1995). They are popularly thought of as benchmarks, standards, or rules of thumb that differentiate when an indicator has changed in a major, step-level way. In so doing, reference values help to characterise the very nature of an environmental trend.

Reference values for key environmental indicators can be conceived in three ways. First, they can be based solely on objective scientific evidence. For example, the availability of a certain amount of water may be determined as the basic minimum human requirement for sustainable health in a particular country or region. If a country can deliver to its population more than the reference value, it is operating in a sustainable fashion. If, on the other hand, a country fails to deliver up to the level of this reference value, human suffering may ensue and stability and security can be negatively affected.

Second, reference values may be conceived in terms of policy targets. These reference values usually place scientific evidence in the context of a country's economic interests, technological capacity and political will. The result is a policy target that is sought by the country and admittedly subjective. Most international environmental agreements and national environmental laws and regulations specify such targets.

Third, as described in Chapter 2, the public perception of an environmental threshold can sometimes play a more significant role than even the scientific benchmark or policy target.

In these three conceptions, reference values help to establish a foundation against which to judge the meaning of changes in environmental trends (Hammond et al. 1995). They help to assign policy significance to indicators and help in the knowledgeable interpretation of change. They assign meaning to increases or decreases in environmental indicators, thus offering the ability to analyse such trends against policy goals and make meaningful comparisons over time and across regions or countries. The consequences of environmental change can be viewed in terms of improving or worsening environmental stresses that, in and of themselves may present a threat, that may generate the conditions for increased threat, or that may influence other contextual factors, which in combination may contribute to an increased incidence or escalation of conflict (Tunstall, Hammond and Henninger 1994).

Reference values can vary from country to country because they are only partially objective in their formulation. They can nevertheless provide useful guidelines for policy makers who are intent on monitoring critical shifts in environmental stress factors that can negatively effect their countries. In this way, reference values, and indicators upon which they are based, can be applied to warn policy makers of environmental changes that may portend the potential incidence of conflict.

Several examples help characterise how environmental change can be captured through reference values. In reviewing a wide range of scientific studies that assessed the minimum water requirements for human and ecological functions (Gleick 1996), it was

Table 5.4 - Working List of Indicators of Sustainable Development

Category	Driving Force Indicators	State Indicators	Response Indicators
Demographic dynamics	• Population growth rate • Net migration • Total fertility rate	• Population density	
Changing consumption patterns	• Annual energy consumption • Share of natural resource intensive industries in manufacturing value-added	• Proven mineral reserves • Proven fossil fuel energy resources • Intensity of material use	
Protection of freshwater resources	• Annual withdrawals of ground and surface water • Domestic consumption of water per capita	• Groundwater reserves • Concentration of fecal coliform in freshwater • Biochemical oxygen demand in water bodies	• Wastewater treatment coverage • Density of hydrological networks
Promoting sustainable agriculture	• Use of agricultural pesticides • Use of fertilisers • Irrigation percent of arable land • Energy use of agriculture	• Arable land per capita • Area affected by salinisation and waterlogging	• Agricultural education
Combating deforestation	• Wood harvesting industry	• Forest area change	• Managed forest area ratio • Protected forest area as a percent of total forest area
Environmentally sound management of solid waste and sewage related issues	• Generation of industrial and municipal solid waste • Household waste disposed per capita		• Expenditures on waste management • Waste recycling and reuse • Municipal waste disposal

concluded that, on average, basic needs (for drinking water, water for human hygiene, water for sanitation services, and water for household needs, such as food preparation) can be met at 50 litres per person per day. (The author makes this finding contingent on country climate and the population's distance from the water source.) If a country falls above that threshold, the population is sustained; if a country falls below that threshold, the author predicts that "large-scale human misery and suffering will continue and grow in the future, contributing to the risk of social and military conflict (p. 83)." Using this benchmark with 1990 data, Gleick found that 55 countries fell below the reference point.

The United Nations Commission on Sustainable Development (1996) has recently produced a set of over 130 sustainable development indicators that identifies "targets" for most indicators. These targets are a mixture of scientific benchmarks and policy goals that are based on scientific rules of thumb. Some examples of these targets are included in Table 5.5.

Table 5.5 - Several Sustainable Development Indicators and their Reference Values

Indicator	Illustrative Reference Value
Wood harvesting intensity to maintain a sustainable yield of timber	Not more than between 70-80% of total annual increment of forests
Biodiversity protected area as a percent of total area	Not less than 10% protected area for each major ecological region in a country as percent of total
Greenhouse gas emissions	Not less than an immediate 60% reduction in emissions is required to stabilise atmospheric concentrations of carbon dioxide at present levels

Source: Adapted from UN Commission on Sustainable Development (1996)

Other benchmarks are set for fisheries, greenhouse gas concentrations, sulphur dioxide emissions, nitrogen oxide emissions, ozone depleting substances, and air quality guidelines in urban areas. Additionally, many scientifically-based targets for particular environmental indicators are set forth in Agenda 21, international agreements, and national legislation.

If these targets are breached, the increased environmental stress may generate more negative consequences and heighten the potential incidence or escalation of conflict, under the influence of unfavourable contextual factors. As indicated earlier, such baselines may differ by eco-region and they may change over time. Preventive action may be useful if the monitoring of such

5.2.3 Situational Contingency Indicators

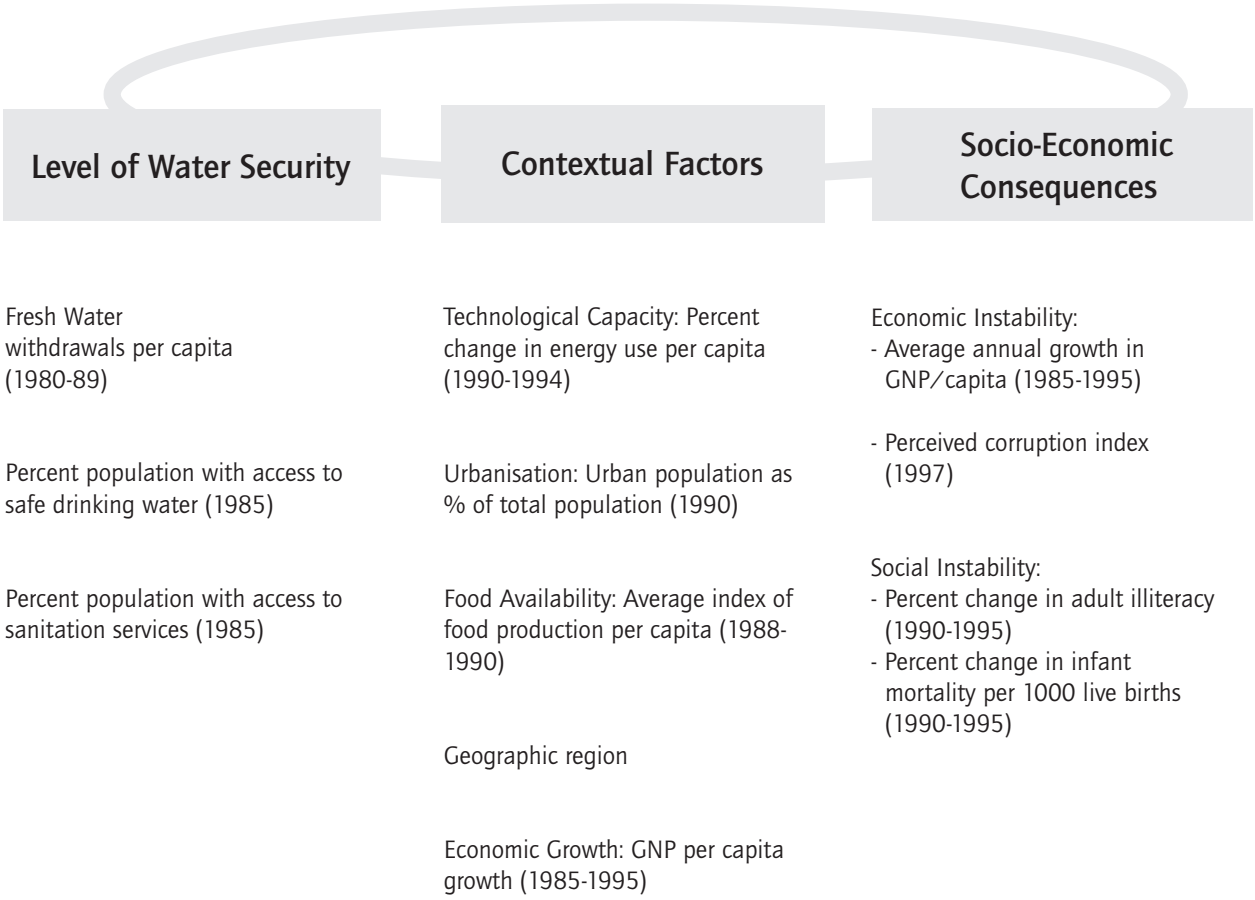
While the environment and security projects and sustainable development research that have been described suggest valuable indicators, the findings are also extremely complex. A large number of indicators have been identified as being relevant, many appear to be highly correlated or overlap with others, and there is little indication as to the priority importance of each indicator. There are two major methodological remedies to deal with these dilemmas and reduce this complexity so that policy-maker-friendly indicators can be designed. One approach is to develop a single index that represents various dimensions by aggregating multiple indicators statistically or mathematically. The United Nations Development Program's Human Development Index and the Index of Human Insecurity (Lonergan, Gustavson and Harrower 1997) are examples of such indices that relate to environment and security. This aggregation approach solves certain methodological problems, primarily reducing a large number of indicators to a single index and weighing the importance of each indicator in the overall equation, thus providing an efficient tool for policy decision-making. However, a major difficulty with this aggregation approach is its methodological complexity. The statistical method of aggregation (factor analysis or a similar clustering technique) produces an index that may be mathematically elegant from the researcher's perspective, but is often opaque to a decision maker; the meaning of the index value is often uninterpretable without the help of an analyst.

The second approach to indicator reduction and simplification is to select marker indicators. Using this approach, a small number of marker indicators are selected from among the larger pool of indicators because they correlate strongly with others and provide a good representation of particular concepts. For example, marker indicators can be identified to represent the level of water security in a society. They would not attempt to aggregate the environmental, economic, social and institutional dimensions of the problem of water security together into a single index. Instead, such marker indicators would pinpoint particular, but seemingly critical, aspects of the water security problem in specific variables, such as the percent of the population with access to safe drinking water. Environmental risks related to air, land, and hazardous waste management, for example, would require the identification and monitoring of different but distinct marker indicators. These simple and easily interpretable marker indicators can serve as the basis for decision-making.

To illustrate the marker indicator approach, a test case of water security was conducted. This test emphasises several important factors. First, it looks at the problem across 160 countries (not just a few case studies), identifying marker indicators not only for environmental variables, but for the contextual conditions that can moderate or exacerbate the environmental problems, and the levels and types of conflict or instability that may result. It is important to look at the relationship among the environmental marker indicators, the situation, and resulting conflict or instability to evaluate the usefulness of the marker indicators as early warning predictors. Second, the model consciously takes a broad view of conflict or instability. Most research concludes that environmental stresses have early economic and social consequences that can contribute to the potential incidence of conflict later on, but may never result in the outbreak of violence. The model recognises these findings by including economic and social indicators of conflict. Third, the indicators in the model take into account the logical time lags between variables, keeping in mind the objective of using these indicators for early warning purposes. Fourth, it was necessary to design indicators that were reasonably collectible and reliable over time. Figure 5.1 presents the particular marker indicators selected for the analysis.[28]

28 *The marker indicators used in this test are merely suggestive of the types of indicators that can be developed. For the purposes of this illustration, data were gathered from the World Bank's World Development Indicators, the Pacific Institute and Stockholm Environment Institute's "Water in Crisis" project, and the University of Göttingen and Transparency International's Corruption Index. Availability of data was a major criterion for selecting indicators for this test; a more lengthy and in-depth assessment would probably uncover different and better marker indicators.*

Figure 5.1 - Test Case: Illustrative Marker Variables of Water Security



The hypothesis posed by this model is: if indicators of water security decrease over time and the society is unable to adapt as a result of contextual factors, negative economic and social consequences are likely to increase. The contextual indicators are viewed as critical controlling factors that either exacerbate or reduce the impact of the environmental stress indicators in analysing the potential incidence of conflict. As anticipated, the statistical findings in our test case demonstrate that when the contextual factors are not taken into account, few correlations are revealed between the water security and consequences indicators. However, when the correlation matrix was controlled for various contextual factors – technological capacity, urbanisation, food availability, economic growth, and geographic region – many more significant relationships appeared between water security and instability indicators.

Several conclusions can be drawn from this test case:

(1) Indicators, by their very nature, simplify complex situations.

(2) Policy makers are likely to use indicators that can be readily understood and interpreted, such as those represented by the marker indicator approach.

(3) Marker indicators can be useful, simple and highly interpretable early warning tools for problems relating to issues of environment and security.

(4) It is essential to monitor and analyse marker indicators of environment and security in context, that is, along with the contextual factors that can either inhibit or facilitate the negative impacts of environmental risks. These contextual factors help determine when environmental change are likely to have a significant impact on conflict or instability. Contextual profiles can be developed that forecast when environmental threat indicators are likely to produce greater conflict or instability.

(5) Environment and security indicators can have immediate impacts on economic and social consequences and, thus can be meaningful early warning indicators that stimulate policy responses to prevent the use of violence.

(6) There is no one set of indicators that is likely to be valid for all environmental stress situations or all geographic regions. Further research can provide some guidance toward indicators that are likely to be useful, but will need to be adapted to different policy settings.

5.3 Data and Data Bases

There are many data bases and sources of data that are available to develop indicators and policy-relevant decision support systems. Many of the existing sources have been reviewed with regard to particular criteria: the existence of appropriate variables, sufficiently broad geographic scope, sufficiently long-time frame of collection, reliability and validity of the variables, accessibility to the data, and capacity to be merged with other data bases. The data bases of relevance to the environment and security problem fit into the following categories: environmental data bases and political-social-economic data bases (see Table 5.6).

In addition to these global sources, many of which contain multiple data bases and are available on the World Wide Web, there are additional sources that can be tapped. At the regional level, databases are available from the European Environmental Agency (EEA) and the Organisation for Economic Co-operation and Development (OECD), for example. Within Central and Eastern European and the Newly Independent States (NIS), the established Regional Environmental Centres (REC) monitor key environmental indicators on a continual basis. The U.S. regional environmental hubs are also potential sources for critical information. Finally, satellite data is becoming available on environmental issues that could provide detailed, precise and continuous information for indicator development. Overall, further research is required to enhance these data bases and to find ways to integrate them in a more meaningful way for policy use.

Table 5.6 - Examples of Global Environment and Political-Social-Economic Data Bases

Sources	Types of Indicators
Environmental Data Bases: Consortium for International Earth Sciences Information Network (CIESIN)	Land quality, ozone, census and population, social development, etc.
World Resources Institute (WRI)	Global environment and natural resource conditions and trends
World Bank: Monitoring Environmental Progress Project	Global environmental indicators
UN Food and Agriculture Organisation (UNFAO)	Land use and irrigation, fisheries, forestry, fertiliser and pesticides, food production, etc.
Global Environment Monitoring System (GEMS)	Freshwater quality, etc.
Global Resources Information Database (GRID) - UN Environment Program	Climatology, soil degradation, global vegetation, ozone, wetlands, natural hazards,
Water in Crisis (Pacific Institute for Studies in Development, Environment and Security and Stockholm Environment Institute)	Global and regional fresh water resources; sanitation and water-related diseases; rivers, lakes and waterfalls; water quality and contamination; agriculture; wetland ecosystems; energy; water usage
Political-Social-Economic Data Bases: Inter-University Consortium for Political and Social Research (ICPSR)	Conflict, aggression and violence; economic behaviour and attitudes; social indicators; mass political behaviour; geography and environment
World Bank: World Development Indicators	Macroeconomic, external economic, population and labour force, health, education, energy use, land use, forest and water resources, government budgets, demand and production
UN Development Program: Human Development Report	Human development index (and its component indicators), human poverty index, gender inequality data
UN Development Program: Development Co-operation Analysis System	Development projects and donor-sponsored technical assistance programs

5.4 Decision Support Systems

Decision support systems (DSS) are information delivery vehicles for early warning indicator systems, data bases, and analytical techniques that can help decision makers develop effective preventive and management responses to environmental stress. To be practical support tools, DSS must not only provide the relevant information and analysis, but must also present it in a way that makes sense to policy-makers.

The first step is usually to identify the information requirements of policy makers who are concerned with environment and security problems. However, conducting a DSS requirements survey of policy makers and their analysts at this time is probably premature, because the field is relatively new. Instead, logical assumptions about their decision support needs can be made:

(1) The DSS should be oriented toward providing early warning of the potential for conflict caused, in part, by the consequences of environmental stress, so that preventive initiatives can be developed. The most important type of early warning that can be provided focuses on particular environmental changes that can produce political, economic, social and demographic consequences which, in turn, may escalate into the use of violence.

(2) DSS should be capable of evaluating how particular environmental problems are affected by contextual factors that may facilitate or exacerbate their potential impact on the incidence or escalation of conflict.

(3) Since it is impossible to prevent all potential threats from escalating into unstable situations, DSS should be able to provide useful analysis and recommended responses at different stages in the evolution of an environmental threat.

A simple DSS that meets these criteria and addresses some of the basic problems faced by most policy analysts is presented here as an illustration of possible decision support systems that can be developed in future. Significantly, this simple DSS presents a "system" that does not employ computerised approaches. Rather, it offers a basic checklist that policy analysts can use to assess whether particular environmental stresses are likely to enhance the potential incidence or escalation of conflicts.

This DSS is called a "Security Profiling Checklist." It is based on an analysis of indicators that can help in distinguishing the risk potential of specific environmental changes. The Checklist is presented in Table 5.7. Its utility requires a short explanation. In Chapter 2, Figure 2.4 presented a conflict continuum in which the intensity levels of environmental stresses were displayed against time and shown to evolve over stages. Two important thresholds were presented in the figure – one at which environmental stress is shown to drive situations to escalate beyond:

(1) An unstable but non-violent threshold or

(2) An unstable and violent threshold.

How do environmental stresses differ and how do contextual factors intervene to cause some situations to spiral past the first threshold and others to spiral past the second? The checklist seeks to help policy makers understand this difference early in the process. As a situation evolves along the conflict continuum, there is a step-level change in the way that environmental stress affects the stakeholders or is perceived by them that causes the problem to change in character – from merely a problem to a security threat. Are there indicators that can help distinguish between environmental stresses that occupy the space below the first threshold and above the second threshold? How can one distinguish between environmental changes that pass through the second threshold and result in the use of violence and what are the indicators that can help to distinguish between these cases? The checklist was developed to help analysts make these distinctions in real situations.

To understand the differences at each of these stages in the evolution of environmental stress, an analysis was conducted of seven historical cases of environmental change – all related to river basin conflicts. These included cases with "no perceived security threat" – the Zambezi River system and the Lower Mekong; cases with a "perceived security threat but no resultant

violence" – the Ganges and Indus; and cases with a "perceived security threat that did produce an outbreak of violence" – the Jordan, Senegal, and Bangladesh-India border. A set of questions forming a checklist was formulated so that equivalent data could be collected for each case (see Table 5.7). It was hypothesised that the answers to these questions, in total, would result in profiles of the cases that would distinguish why some were perceived as "no threat" cases, some as "threat with no violence" cases, and some as "threat with violence" cases. If these seven profiles do indeed significantly distinguish the cases, then the checklist could be used by analysts as a practical tool to understand the likely implications of current environmental stresses.

In particular, the checklist postulates that the evolution of an environmental stress depends on the objective intensity of the stress which may produce a threat, the perceptions of stakeholders based on their interests and priorities, their political willingness to act, and the availability of co-operative mechanisms to provide a way out of conflict. As reflected in the checklist questions in Table 5.7, these are intended to be the type of issues that an astute analyst could answer in a practical way concerning a current situation involving environmental stress.

The actual profiles collected on the sample of seven cases effectively forewarned how far the situation would evolve in terms of the potential incidence or escalation of conflict.

- The cases in the "no threat" category, for example, were characterised by no hostile actions, no attempt by any of the parties to dominate the other, and perceived benefits from co-operation.

- The cases in the "non-violent" security threat category, on the other hand, demonstrated some hostility early on in the cases, attempted dominance by one of the stakeholders, and clear perceptions of a threat to national interests.

- Finally, the cases in the "violent" security threat category had a longer history of deeply rooted animosity among the stakeholders, perceptions of severe encroachment on national interests, and resistance to dialogue among the parties.

If policy makers used this checklist to evaluate a current situation of potential environmental stress and were made aware of these profiles early in the evolution of a potential threat situation, they would have the opportunity to respond appropriately and quickly to reduce the potential for conflict escalation. Insights that can be drawn from a simple profiling checklist such as this can serve as basic threat assessment information; it can be accessible to policy makers from any country that collects data on developing environmental stress situations.

Table 5.7 - Security Profiling Checklist

Security Profiling Checklist
1. What is the environmental stress?
2. Who are the major stakeholders (countries, subnational groups, etc.)?
3. How severe is the environmental stress perceived to be by each of the stakeholder groups?
4. What are the perceived stakes or interests of each group that are being affected by the environmental stress? Are the interests seen to be extreme? Are the interests deeply rooted or emotionally-based? Are the interests high on the political agendas of the stakeholder groups?
5. Is there a political willingness (a strong interest) on the part of each stakeholder to resolve the problem peacefully?
6. Are there existing co-operative mechanisms (regimes, agreements, regional/international organisations, etc.) that can help avert or resolve the situation? Are there other issues that are exogenous to the environmental stress that might be triggered or stimulated by the environmental stress?

6 Policy Responses

Key Findings

General Principals

- *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 approach must integrate response mechanisms from environmental and development policy and from the foreign and security policy sector.*

- *Based on their comparative advantages, each policy sector can contribute, with its specific problem-solving mechanisms and instruments, to the prevention or management of the incidence or escalation of conflict at different geographic levels and different stages of the conflict dynamic. Since environmental stress often contains the seeds for both conflict and co-operation it is suggested that all actors have to integrate the conflict dimension into their thinking and policy mechanisms and to mutually co-ordinate their response mechanisms. Co-operation on shared environmental issues can establish lines of communication that may be valuable in reducing regional tensions on non-environmental problems.*

- *As the global commons cannot be managed by any nation state alone, co-operation of governmental and non-governmental actors at the different levels has to be enhanced in preventing and managing environmental conflict.*

Environmental Policy

- *Environmental stress poses a potential threat to security at all geographic levels, and can have consequences across a range of levels, such as global environmental stresses which may raise the potential incidence and escalation of conflict at the local and regional levels. Taking preventive action on environmental stress thus is the most appropriate approach to preventing environmental conflicts. Such preventive action is needed at all levels, but since environmental stresses tend to be rooted in transboundary, regional and global environmental problems, international and regional environmental agreements play a particularly important role in preventing environmental conflict.*

- *Environmental policy at the national level and through international institutions has achieved a remarkable record of progress in the last two decades (e.g. air pollution abatement, protection of the ozone layer). In addition to their role in promoting a better environment, co-operative environmental institutions have contributed to confidence building and to avoiding conflict escalation between countries (e.g. management of river basins). However, a number of environmental challenges have grown in importance and the security relevance of environmental stress has increased. Efforts to address environmental stress, its consequences, and their impact on the potential incidence or escalation of conflict thus needs to be intensified.*

- *In addition to improving the common knowledge base of policy-making on the relationship between environment and security, comprehensive assessment mechanisms need to be developed which take the environmental impacts of policies into account. They should also be extended to assess socio-economic impacts of environmental stresses on social,*

political, and economic conditions and on security. These comprehensive assessment mechanisms should be institutionalised and used at all levels of decision-making as a standard operating procedure for integrating environmental considerations and security concerns of environmental change that will include the modification or abandonment of projects, programs or policies. Other policy areas such as transport, agriculture, energy, social and security policies need to make further progress in taking a long-term perspective and internalise external costs.

- *There is great need for strengthening, re-examining, and reforming the international institutional framework, especially in a regional context. This relates in particular to natural resource regimes, international environmental law, and the role of UN institutions. Efforts should be intensified, particularly in regional contexts, to codify rules for the management of natural resources and especially shared water resources. Existing agreements, e.g. to combat desertification and manage the use of resources, should be strengthened.*

- *To benefit fully from international and regional environmental agreements, they must be ratified, implemented and enforced effectively. To improve implementation, the transfer of knowledge and technology should be enhanced and existing mechanisms for capacity building strengthened. International financing must be made available and innovative implementation instruments, including market-based instruments such as emissions trading and joint implementation and common policies and measures, further explored and applied properly.*

- *Strengthened verification and compliance mechanisms, possibly including binding consequences and penalties in cases of non-compliance, can enhance mutual trust and confidence among parties to international environmental agreements. Efforts are also needed to foster mechanisms for amicable dispute resolution, especially in resource regimes. In this context, existing dispute settlement procedures (International Court of Justice, World Trade Organisation) as well as other innovative approaches deserve consideration.*

- *Decision-making in international institutions needs to be facilitated. This can, inter alia, be achieved through an increased use of innovative procedures of majority decision-making and other innovative approaches to consensus building. This includes the establishment of expert panels on specific questions and focused round-table discussions. Such mechanisms also allow for broader societal and non-governmental input. Basic participatory rights of non-governmental actors such as access to information, documentation and decision-makers need to be guaranteed. In general, public and private efforts and activities are to be co-ordinated and integrated for effective solutions.*

- *Given the large and increasing amount of international environmental institutions, a review should be initiated with the aim of streamlining the body of existing rules. At the global level, relevant international organisations 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 fora and structures.*

Development Policy

- *In order to establish preventive mechanisms for environmental conflicts, development policy, which is specifically directed at ameliorating selected consequences and contextual factors, plays and important role in respective regions. Development policy contributes to stabilising 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 structures which have contributed to conflict in the past. 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, democratisation 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 society to be incorporated 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 there is a need for shared and co-ordinated approaches to development co-operation among the various international donors and regional level bodies to allow for more effective and appropriate conflict prevention and peace building. Selected forms of development assistance should be shaped by the varying potentials of the countries involved, according to the needs and interests of their populations. Preventing unnecessary debt burden and economic dependency is a critical component to sustainable development.*

- *The various institutions in the global community are asked to continue improving the different responses mentioned above. The need to scale up popular development initiatives implies turning attention not only to national political structures, but also to developing sound long-term macroeconomic stabilisation plans and continued financing for projects. This involves the need for improving the methods for organisations and related groups to exchange information, to create and maintain feasible budgets for project implementation, to adopt common approaches for economic and aid co-ordination, and to provide mutual support. It also entails building new forms of international co-operation via the reform of existing global institutions and for all donors to improve common standards for safeguards which prevent negative social impacts resulting from development projects.*

Foreign and Security Policy

- *As environmental conflict is a cross-sectoral issue, it also calls for foreign and security policy responses in order to prevent escalation and to address the underlying consequences of environmental stress. Security institutions should increase their awareness of the links between environmental stress and security in order to contribute to the prevention of environmental conflicts. Environmental issues are valuable in establishing dialogue and co-operation. They serve as confidence building measures that may be used to promote regional stability. The aim of responses enumerated in the following is to establish links between environmental policy and foreign and security policy.*

- *This global, integrative and co-operative approach includes the contributions of foreign policy and security institutions' specific instruments and mechanisms which can support the prevention or resolution of conflicts. Enhancing co-operation and interaction amongst existing institutions based on their respective charters, missions and capabilities is needed. This will require communication among foreign and security policy actors and institutions with relevant development and environmental organisations and stakeholders within civil society. While environmental issues may serve as triggers for conflict that threaten regional stability, co-operation on commonly shared environmental issues can establish dialogue and lines of communication which are valuable in reducing regional tensions of a non-environmental issues. The establishment of regular interaction and consultation at the different levels of policy-making is required for co-operative security and for information sharing.*

- *Security institutions could contribute to information sharing on the basis of available data, including early warning and remote sensing data, according to their respective mandates. In order to establish communication and exchange between security organisations and other relevant actors in the field of environment, the opportunity to designate, within security organisations, an official responsible for such a task could be discussed. Foreign and security institutions can enhance and strengthen the positive activities of the parties involved through the provision of confidence building measures such as treaty monitoring and short-term stabilisation 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, capitalise 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 principal 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 and demographic factors and the perceptions of threat should be established as a long-term stabilisation measure. The international donor community, through short-term stabilisation projects, can demonstrate their potential advantages of deescalating or resolving the conflict. Post-crisis management mechanisms should also assess the environmental stress generated over the course of a crisis and its resolution. Furthermore, it should consider the social, economic, demographic, and political consequences resulting from environmental stress.*

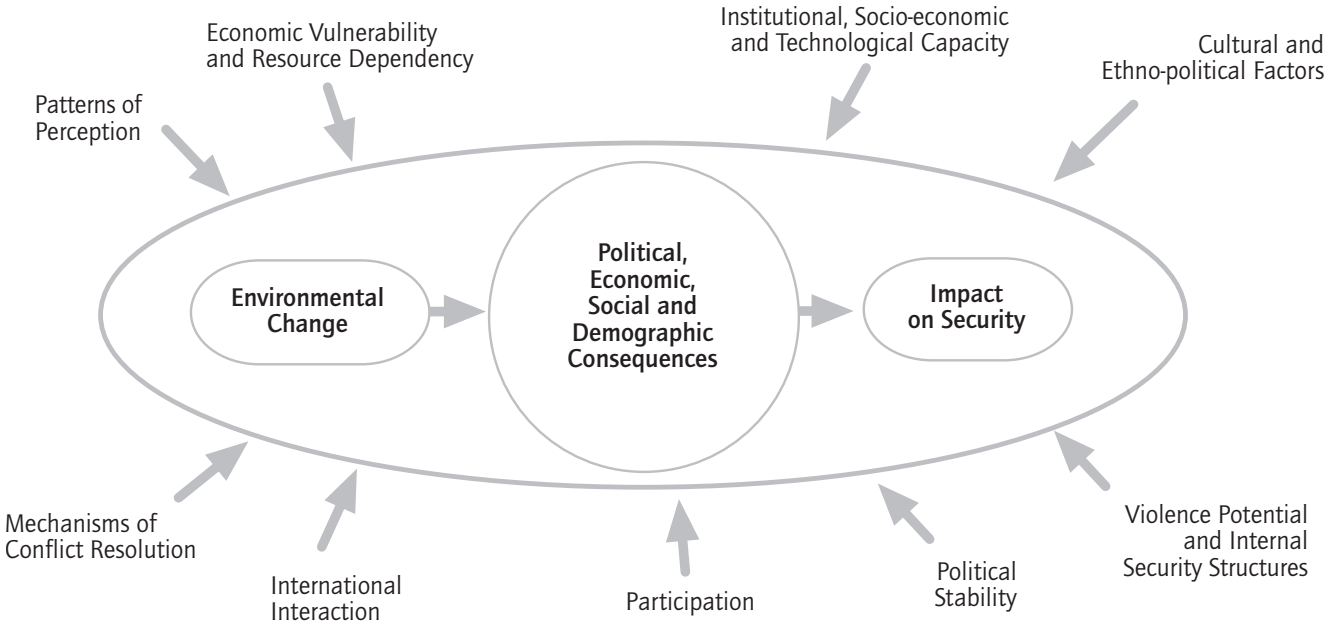
6.1 Introduction

The previous chapters identified complex inter-linkages between environmental stress and the potential incidence or escalation of conflict. It was demonstrated that a multitude of contextual factors such as political, economic, social, or demographic factors influences environmental conflict, creating a multi-causal and reciprocal relationship between environmental stress and the potential incidence or escalation of conflict (Homer-Dixon 1991, 1994; Baechler 1996). Furthermore these contextual factors (see Figure 6.1) were discussed and their impact on whether environmental change can be resolved co-operatively or is likely to result in conflict, has been explored (for purposes of further clarification of contextual factors, see section 2.4).

These findings call for a policy approach that integrates existing measures of conflict prevention and resolution, by taking into consideration a range of political, economic, social and demographic factors (Carius and Imbusch 1998). It also calls for co-operative application of these measures by the respective actors in order to manage environmental stress and possibly prevent conflict.

In this last chapter of the report, policy responses are presented which reflect this integrated approach to be implemented in a co-operative way. The proposed response mechanisms take a preventive approach to dealing with potential conflict. Rather than recommending a specific type of response to a specific actor, organisation or government, they are general in character. References to specific organisations or treaties serve as illustrations of possible policy options.

Figure 6.1 - Conceptual Model: Relationship Between Environmental Change and Security



Conflicts are understood as dynamic processes with different threshold levels of intensity along a continuum ranging from highly co-operative to highly conflictual situations (stable peace, unstable peace, crisis, war). Thus conflict comprises a whole continuum. The policy responses presented in this study are to be implemented at the earliest possible stage along the conflict continuum. Early action, which is taken at a stage when environmental stress is still a matter of dispute without the use of violence, is much more effective than action at the stage of serious crisis or war. In addition, at an early stage of conflict the range of measures that can be applied is much broader. At this stage, environmental and development policy mechanisms can be applied in order to tackle the environmental and socio-economic sources of conflict. If conflict has already reached a higher level on the continuum, policy measures will have to focus on the prevention of the use of violence. Mechanisms dealing with the sources of conflict and thus preventing it in the long-term are of limited meaning at this stage.

An important result of this study is that conflicts with an environmental component are cross-sectoral. Their diverse dimensions must be taken into consideration when developing response mechanisms in order to resolve or manage them. In the following, environmental, development, foreign and security policy responses are presented. While all mechanisms are preferably taken at an early stage of conflict, each set of mechanisms has its specific value at a specific stage along the continuum.

Environmental policy is mainly directed towards the protection of the environment, resource management and the management of environmental stress. The management or remediation of environmental stress has the highest potential pay-off among policy responses because it is instituted at an early stage along the continuum, tackling the environmental sources of conflict and thus is the most preventive approach. Environmental policy also holds additional opportunities for possibly resolving existing conflicts at an early stage by building a base of familiar interaction and confidence through co-operation and confidence building mechanisms on environmental issues.

Development policy plays an important role in dealing with unfavourable economic, political, social and demographic consequences and related contextual factors. Areas such as economic vulnerability or lack of institutional capacities have been identified as important in raising the potential incidence or escalation of conflict.

Finally, foreign and security policy provide mechanisms and tools to address the unfavourable political consequences and the impact of these consequences on the potential incidence or escalation of conflict.
By identifying potential areas for escalating levels of conflict, foreign and security policy can contribute to confidence building, crisis prevention, crisis management and finally, management of acute conflict.

Based on their comparative advantages, each policy sector can contribute with its specific problem-solving mechanism and instruments to the prevention or management of the incidence or escalation of conflict at the different geographic levels and at different stages along the conflict dynamic.

Nevertheless all three groups of policy responses follow shared principles. These include the principles of sustainable development, precaution, integration, and co-operation.

6.1.1 Principle of Sustainable Development

Over the last decade, sustainable development has been increasingly discussed as the guiding principle for industrialised and developing countries alike (UNCED 1992). The principle of sustainable development is meant to be the prevailing concept in international co-operation. Sustainable development combines the goal of economic growth with ecological sustainability while aiming at social justice for present and future generations. Most importantly it contributes to human welfare and social stability (WCED 1987).

6.1.2 Principles of Precaution, Integration and Co-operation

All policy responses focus primarily on early, precautionary action, for preventing environmental stress and its impact on the potential incidence or escalation of conflict. The principle of precaution is understood as the most effective approach of dealing with a problem.

The capacity to respond to environmental conflict depends on the willingness and ability of the different actors involved to integrate the possible incidence or escalation of conflict into their thinking and policy mechanisms and to mutually co-ordinate their response mechanisms. It is necessary to enhance co-operation and to establish numerous and effective connections between the traditionally separate environment and security mechanisms and institutions. The environmental community should take security issues into account; likewise the security community should take environmental concerns into account. All actors should work towards enhancing dialogue and co-operation, based on and contributing their respective problem-solving capacities and mechanisms.

The nation-state traditionally has been the primary decision-making unit in international relations. Nevertheless, the growing trend of interdependence in the realm of economics, environment, and security has relativised the principle of national sovereignty. In the case of managing the global commons, it is increasingly recognised that states alone are insufficient to manage shared ecosystems. Instead environmental conflicts are dealt with more effectively through joint management and by implementing multilateral procedures and mechanisms. Sovereign nation states remain the key players for any form of co-operation at the international level.

The following chapters refer to these common baselines in order to establish coherent response mechanisms to environmental conflict. The following responses do not call for radical changes to the international structure but aim to elaborate, enhance and integrate existing institutions and instruments.

6.2 Environmental Policy Responses

6.2.1 General Principles

6.2.1.1 Environmental Policy as Conflict Prevention

A number of environmental stresses that may contribute to the potential incidence or escalation of conflict have been identified. Scarcities of renewable natural resources such as water and soil are examples of environmental stress the consequences of which constitute a source of conflict within and between states that is growing in importance. Other environmental problems ranging from global climate change and the loss of biodiversity to locally limited food stocks or marginalised arable land, contribute to worsening resource scarcities and may lead to, or enhance mass migration, poverty and refugees which may in turn increase the potential for conflict. Environmental stress poses a potential threat to security at all geographical levels, and can have consequences across a range of levels, such as global environment stresses which may raise the potential incidence or escalation of conflict at the local and regional level.

For example, the effects of global climate change on sea level rise are experienced mainly in small islands states and also in low lying countries and heavily populated coastal zone settlements. Therefore, preventive action in order to manage global environmental stress must be the result of concerted international action. Designing effective co-operative policies for the management of shared natural resources and the mitigation of environmental degradation that are of common concern thus constitute a contribution to preventing conflict. Furthermore, taking preventive action at the early stages avoids high follow-on costs. It is therefore a particularly effective option. Environmental co-operation even provides much needed consultative frameworks in cases of latent inter- and intrastate conflict.

6.2.1.2 The Environment as a Trigger for Co-operation

Intergovernmental co-operation on reducing environmental stress has been established at the global and regional levels in many institutional frameworks. In addition to making progress on the environmental issues involved, such co-operative environmental institutions have contributed to confidence building and to avoiding conflict escalation between countries, as exemplified by the environmental agreements in the framework of the UN Economic Commission for Europe (UNECE) and various co-operative institutions for the management and protection of water resources, such as the co-operative management of the Mekong River or the Jordan River basin. Experience shows that the solution of environmental issues in these frameworks, and in others, involves many sectors of society and needs the involvement of various non-governmental actors. Those that are concerned by the impacts of environmental problems and/ or the policies considered to mitigate them have to have the opportunity to take part in the co-operative design of the solutions.

6.2.1.3 The Need to Act

Environmental policy at the national level and through international institutions has achieved a remarkable record of progress in the last two decades as evidenced, inter alia, by successes in the reduction of industrial air pollution, especially within Organisation for Economic Co-operation and Development (OECD) countries and the progress towards the world-wide phase-out of ozone depleting substances (Haas et al. 1993). Nevertheless, other environmental challenges have grown in importance and the security relevance of environmental stress has increased in general. There is a need to intensify efforts in order to address environmental stress, its consequences, and their impact on the potential incidence or escalation of conflict.

Water and food shortages, scarce resources in general, drastic rates of environmental change and environmental degradation (such as global climate change) that further restrict the availability of scarce resources or increase the potential for environmental catastrophes deserve particular attention in this respect. To effectively counter these challenges, new and innovative approaches are needed in the formulation, implementation and enforcement of environmental policies. The cross-cutting characteristics of these challenges call for the enhanced involvement of all relevant sectors of society and policy-making in devising effective solutions to environmental threats to security and the integration of environmental concerns in all relevant areas of policy-making.

6.2.2 Responses

6.2.2.1 Integration and Co-ordination

Analysing the complex relationship between environment and security makes it abundantly clear that the role of the environment in triggering conflict is dependent on, and interrelated with several factors.
A comprehensive effort is thus needed to integrate environmental concerns into all other policy areas and relevant institutions and contexts in order to at least manage, if not prevent the security impacts of environmental stress. Transport, agriculture, energy, social and other policies all need to make further progress in taking a long-term perspective and internalise external costs. In doing so, the following points need particular attention:

6.2.2.2 Enhance Common Knowledge Base

To improve the common knowledge base of policy-making on the relationship between environment and security further empirical research is needed, specifically in-depth case studies and comparative studies. This could enhance our understanding of the relationship and the interplay of environment and security under specific socio-economic, institutional and cultural conditions and could help in developing further relevant concepts and approaches. Furthermore, there is a need

for an improved common database, in particular disaggregated data on relevant environmental, economic, social and demographic factors.

A number of environmental, scientific and technical organisations such as EEA, UNEP, GEMS, OECD, UNECE, and also environmental agreements have relevant data available. Data from private organisations such as NGOs, multinational companies, international standardisation bodies, etc. can also be beneficial to the international community. In addition, security establishments have environmental data (in particular satellite imagery) and the capacity to contribute to the common knowledge base.

Global and regional monitoring networks need to be established, drawing on the available data sources and including the development of scientific and technical programmes, to characterise the conflict potential of specific environmental conditions on a regular basis. In order for the monitoring network to be based on high-quality data, reporting of environmental data needs to be strengthened, in particular in the framework of relevant multilateral environmental agreements. In developing countries which lack the necessary means, and in some countries with economies in transition, this will require devoting special efforts to building adequate administrative and expert capacity. Enhancing the common knowledge base will finally only be successful if the freedom of scientific research is guaranteed, information is shared freely and scientific exchange and co-operation are supported so as to strengthen mutual trust and confidence and make the system as efficient as possible by creating synergies whenever possible.

6.2.2.3 Comprehensive Assessment Mechanisms

Environmental Impact Assessments (EIAs) have proven to be a beneficial and successful instrument for integrating a number of environmental considerations into the planning and execution of specific projects. To further its value, assessment of environmental impacts could, if not already in practice, be extended to relevant projects, programs and policies including any relevant program in development assistance and technology transfer (i.e. to developing countries). The idea of an EIA for policies and programs might serve as an example for necessary comprehensive political assessment mechanisms that go beyond traditional policy measures to assess the socio-economic impacts of environmental change. Its principles and procedures should be extended to assess the impact of environmental stresses on social, political, and economic conditions and on security. These comprehensive assessment mechanisms should be institutionalised and should be used at all levels of decision-making as a mandatory and routine procedure for integrating environmental considerations and security concerns related to environmental change.

6.2.2.4 Institutional Reform

Clearly, this integration process should extend beyond environmental institutions. Consideration of environmental issues and principles of sustainable development could be institutionalised in all international, regional, national and sub-national bodies by building effective mechanisms into their structures. In so doing, the development of procedures and criteria should be considered which will allow that projects, programs or policies entailing unacceptable environmental consequences be modified or abandoned. This may include the establishment of institutions such as councils, departments, bureaux and officers for sustainable development that are to enforce the observance of agreed-upon principles of such development.

6.2.2.5 Integration of Societal Forces

In dealing with relevant environmental risks, governmental policies rely on and profit from active participation and support for societal actors. Because of the cross-cutting character of environmental stress, public and private efforts and activities need to be co-ordinated and integrated. While government action is indispensable, non-governmental actors which contribute to environmental problems, concerned by the impacts or affected by policies to mitigate them need to be part of the solution. They need the necessary rights

and means to participate in policy-making and governments need to seek their involvement for effective responses, while at the same time balancing particular interests. As a recent example, the Pan-European Conference of Environmental Ministers agreed upon the Århus Convention, which deals with the right to information and participation in policy-making.

6.2.2.6 Dialogue and Co-operation

In general, dialogue and co-operation within and among governments, economic and societal sectors, policy areas and different levels of policy-making should be enhanced. This general effort at integration has to be balanced by the need to focus resources at the level best suited for the solution of the environmental issue at hand. In particular, a number of environmental stresses such as water scarcity are most pertinent at the regional level making regional approaches to their resolution most appropriate. In many cases several levels are relevant, as evidenced by the role of global climate change in contributing to regional and local water scarcities.

6.2.3 International and Regional Environmental Agreements

Environmental stress tends to be transboundary in nature. As a result, international and regional environmental agreements are particularly promising for their prevention and redressment. These agreements can provide institutionalised frameworks for the interaction of actors, they can supply scientific knowledge and information to their adherents. While international environmental agreements provide the benefit of establishing rules for a high number of signatories and are therefore particularly useful for the regulation of global environmental problems, regional environmental agreements can provide very effective, problem specific policy frameworks. Many environmental conflicts which have environmental stress as a contributing factor take place at a local and regional level. For example conflicts over agricultural land may have social impacts such as population movements or economic decline, which constitute a threat to the stability of a region. Therefore, the ratification and implementation of effective environmental agreements at a national and regional level need to be promoted. Regional environmental agreements serve a particular purpose in regions that lack integrated regional security mechanisms or integrated economic structure. They allow the parties to deal co-operatively with region-specific environmental stress in a very problem-oriented manner, and contribute to confidence-building between the parties while supporting regional integration.

To benefit fully from these international and regional environmental agreements, they must be ratified, implemented and enforced effectively. To this end, further efforts need to be undertaken in light of various shortcomings of current implementation.

6.2.3.1 Capacity Building

Since many of the implementation problems in the context of environmental agreements are due to the lack of adequate means and resources, capacity building efforts, including, inter alia activities by United Nations Development Programme (UNDP), the World Bank, the World Trade Organisation (WTO), the Global Environment Facility (GEF) and regional banks need to be further pursued and strengthened. While continued efforts to enhance efficiency in existing resource flows will provide part of the needed resources, additional resources are required to build sufficient capacity in developing countries and countries with economies in transition in future. Technology transfer will play an important role in providing the necessary resources for effective implementation of environmental agreements. Transfer should include environmental technology, but should also comprise the transfer of knowledge. Finally, in the context of globalisation, continued efforts to improve the framework conditions of developing countries and countries with economies in transition will assist them in increasing their own capacity building initiatives.

6.2.3.2 Innovative Implementation Instruments

The urgency of environmental stress in certain scenarios calls for the increased use of innovative instruments for the implementation of international objectives and obligations. In particular, when market-based instruments such as joint implementation and emissions trading are applied properly, they hold the potential for increasing the effectiveness and the efficiency of the implementation of international environmental agreements. In light of the growing interdependence of nation states and their economies, mechanisms for elaborating common and co-ordinated policies and measures such as environmental taxes – that might improve implementation, but are not applied due to fear of competitive disadvantages – need to be explored further in this context.

6.2.3.3 Verification and Compliance

The establishment and conservation of mutual trust and confidence among the parties to international environmental agreements depend on the availability of reliable information and of effective responses to cases of non-compliance. As international obligations become more demanding, particularly for industrialised countries, there is a need to strengthen efforts in this area. This should involve regular processes of in-depth review of national information, as provided by governments and independent bodies.

To signal the importance of compliance to national actors and increase the mutual assurance of committed actors, possible reactions to failure to fulfil international obligations should include adequate binding consequences and penalties, taking due account of the respective responsibilities and capabilities of the parties concerned. Such binding consequences and penalties should also be available to legal structures. For example, the Council of Europe recently signed a Convention on the Protection of the Environment through Criminal Law which is aimed at improving the protection of the environment at the European level by using the solution of last resort criminal law in order to deter and prevent conduct which is most harmful (Council of Europe 1998).

6.2.3.4 Dispute Settlement

As an increasing number of users draws on scarce natural resources and international obligations are strengthened and enforced effectively, the potential for disputes between states and parties to international environmental agreements increases. Effective dispute settlement mechanisms should be fostered. Efforts to resolve conflicts regarding the use of natural resources should be improved, especially in resource regimes. Existing co-operative instruments of conflict resolution employed in international environmental law, such as bilateral consultations, information exchange, implementation control or enhanced reporting mechanisms, are examples of confidence building measures. In this context, the dispute settlement mechanisms of international institutions such as the International Court of Justice (ICJ) and its environmental chamber, or the World Trade Organisation (WTO) and its dispute settlement panel could be enhanced or used as models in international environmental agreements. Other forms of institutionalised dispute settlement mechanisms, such as the establishment of an International Court of Public International Law of the Environment, are options under consideration (Rest 1994; Beyerlin and Marauhn 1997).

6.2.3.5 Confidence Building through Resource Management

Environmental problems and the question of resource distribution can create or enhance opportunities for co-operation, as well as contribute to the conditions for conflict. The management of shared natural resources can play a major role in confidence building among states by helping to create the conditions under which trust among the parties is enhanced. Resource management mechanisms and regimes can help to stabilise relations among parties by providing them with a forum for regular interaction on issues that are recognised by the parties as being to their mutual benefit. Confidence building is also enhanced by verification mechanisms that allow for greater transparency among the parties.

Resource management mechanisms and regimes should seek to enhance their confidence building applications through regular interaction amongst the relevant parties. There is a need to emphasise transparency in policies and procedures toward supporting the resource management scheme.

The 1979 Geneva Convention on Long Range Transboundary Air Pollution is an example of a resource management regime that also serves as a confidence building measure. The Convention was the first internationally-legally binding instrument to deal with problems of air pollution on a broad regional basis. It also had the effect of serving as a bridge between Eastern and Western Europe by providing an additional forum for interaction during the Cold War. Furthermore, by providing a verification mechanism, which increased the transparency of the parties relative to one another, relationships amongst the parties were improved and trust was enhanced.

Additional examples also include: 1) the International Commission of the Great Lakes, which in addition to its role as a mechanism for dispute resolution and resource management, enhanced the positive stability of the relationship between the United States and Canada; and 2) the Zambesi River Basin Commission, which has served to build confidence among numerous riparian states as they proceed on economic development and other projects using and preserving the quality of that resource for the future.

6.2.4 Develop Decision-Making in International Institutions

Due to the prevailing principle of consensus in international affairs, decision-making in international institutions has proven to be particularly cumbersome and lengthy and has tended to favour less ambitious international environmental programs, even where their adherents represent but a small minority. This has made the flexible development of international rules difficult (Sand 1990). To improve this situation the following steps may be warranted.

6.2.4.1 Majority Decision-Making

To strengthen and facilitate the international decision-making process, the use of majority voting should be broadened. In doing so, care has to be taken that the legitimate interests of countries can be articulated and are taken into account in the process. "Double-weighted" majority requirements – where majorities of both the industrialised and the developing countries must concur – have proven useful in some contexts such as the protection of the ozone layer and the GEF. Other formula for balancing the interests of parties by establishing veto and minority rights for different groups might be needed in other contexts. This will help to democratise decision-making in international environmental institutions. Decision-making should also be facilitated and accelerated by establishing smaller representative committees to find solutions to clearly defined problems.

6.2.4.2 Enhancing Non-Governmental Input

A further element of developing international decision-making processes is enhancing the participatory rights of societal actors. Since these actors eventually have to bear the cost of action and inaction, they are directly affected by international decisions. Their voice should be heard and taken into account by policy-makers. This will enhance societies' and peoples' acceptance of international decisions, where they would otherwise feel distanced from and unable to influence political decision-making at the international level. Although the need for non-governmental involvement varies between different kinds of decision-making, participatory rights that should be granted in international processes in general include free flow of information including documentation, active participation in international fora and regular access to decision-makers.

6.2.4.3 Innovative Consensus Building

In addition, selected innovative approaches to consensus building exist that should be expanded to extend the areas of common interest which will facilitate decision-making. Such innovative mechanisms include the establishment of expert panels on specific questions that support seeking solutions by arguing rather than political bargaining. Also, round-table discussions on specific topics in the framework of negotiations reduce the likelihood of pure posturing and help focus negotiators on matters of substance. Such informal events promote a common learning process, support the establishment of a knowledge-based consensus and related scientific or expert communities and allow for non-governmental and expert input for the common good.

6.2.5 Strengthen the Relevant International Institutional Framework

Since environmental stresses tend to be rooted in transboundary, regional and global environmental problems, they are best addressed through international institutions. Strengthening the relevant framework of international institutions is thus of paramount importance and better integrating environmental concerns in the activities of major international organisations such as WTO, UNCTAD, UNDP, FAO and international finance institutions. The following steps deserve particular attention.

6.2.5.1 Natural Resource Regimes

Whereas the number of international environmental agreements has increased dramatically during the last two decades, gaps still remain especially with respect to shared natural resources (soil, water, forest, fish stocks, etc). Efforts to codify rules for the management of natural resources should be continued and intensified, particularly in regional contexts. Shared resources in many parts of the world constitute areas for potential conflict. There is an urgent need for institution building by agreeing on common rules in these areas.

At the global and regional level, agreements on the management of natural resources such as the UN Convention on Highly Migratory Fish Stocks or the UN Framework Convention on Climate Change should be strengthened and further developed. Resource regimes have the potential to strengthen mutual trust and dialogue among stakeholders and to provide forums for effective resolution of disputes, which might also prove beneficial in dealing with other environmental and non-environmental issues.

6.2.5.2 Review and Reorganisation of International Environmental Law

Given the large amount and diversity of international environmental rules in a number of institutional contexts, there is an increasing overlap and potential for confusion and conflicting provisions. A review of existing international environmental law should thus be initiated with the aim of streamlining the body of existing rules. On that basis, it will be possible to identify remaining gaps and to fill them appropriately. Part of this reorganisation of international environmental law should give consideration to the establishment of an International Court of Public International Law of the Environment that would be tasked with taking final decisions on issues of the implementation of environmental obligations in general.

6.2.5.3 International Organisations

In general, the diverse activities and institutions involved in the fields of environment and security have to be co-ordinated properly and the international capabilities needed to respond to environmental stresses and the negative consequences for security, enhanced. This should be taken into account in the on-going process of the reform of the UN and other international organisations. The voice of the environment within the

family of UN organisations and beyond is still inadequate. Relevant international bodies such as the UNEP must be strengthened to enable them to work more effectively to solve environmental problems that pose potential security threats. Current initiatives on strengthening UNEP's competencies in establishing and operating an early warning system for environmental threats should be improved. Strengthening UNEP will involve making resource flows more predictable and increasing its competencies.

In addition, the capacities of other relevant international organisations such as the UNDP to support sustainable development also need to be strengthened. In order to streamline existing activities and enhance the weight of the environment in international politics, there are several proposals for setting up an international authority such as a Global Environment Organisation (Esty 1994) or a World Organisation for Sustainable Development (Biermann and Simonis 1998) that would combine, synthesise and expand the activities of existing organisations.

6.2.5.4 Environment and Security Nexus

Despite the close relationship between environmental problems and security risks, the policy areas of environment and security have remained largely separate. Enhancing exchange, integration and co-operation between the environment and the security community might start from informal arrangements, as extensions of current regional organisations and regimes, or possibly by establishing new fora and structures which allow environment and security issues to be dealt with in an integrated manner.

6.3 Development Policy Responses

The conceptual work of the previous chapters showed that environmental conflicts and the their potential incidence or escalation into violence are likely to evolve in countries which often face combinations of political instability, unresolved territorial disputes, or socio-economic problems. These include high population growth, migration, refugees, economic decline and poverty. The potential incidence or escalation of conflict are thus caused by the consequences of environmental stress occurring under unfavourable political, economic, social, and demographic contextual conditions. In order to establish preventive mechanisms to environmental conflicts, development policy, which is specifically directed at ameliorating selected consequences and contextual factors, plays an important role in respective regions. First, development co-operation should be directed at unfolding a national policy which recognises the consequences connected to environmental stress and which is capable of setting adequate national priorities. At the same time, development co-operation should support these national efforts where a country's own resources are not sufficient or are inequitably distributed.

The information presented in this section is by no means exhaustive; it is meant to provide policy makers with general information on existing development policy responses and how these might be improved. Much of the discussion complements the environmental policy responses suggested in the previous section. In general, there are many approaches being undertaken that require improvements and substantial co-ordination among the various players in the development community.

6.3.1 General Principles

6.3.1.1 Complexity of Conflicts

Experience has confirmed that the deep-rooted societal conflicts that often underlie an environmental conflict do not follow any standard, predictable pattern or cycle. This implies that many of the development policy responses concerning conflict prevention and peace building may also be useful in reaching durable peace after a violent conflict. They should therefore address

environmental stress and its unfavourable political, economic, social and demographic consequences and contextual factors at all stages along the conflict continuum. For instance, a number of possible measures can be implemented to help defuse the potential for violent conflict prior to its escalation. These range from more traditional areas of co-operation, such as economic growth and poverty reduction programmes, to democratisation and respect for human rights.

Post-conflict situations on the other hand often provide special opportunities for political, legal, economic and administrative reforms to change systems and structures which may have contributed to economic and social inequities and conflict in the past. Therefore developmental policies which aim to find ways to help prevent conflicts at their roots must address the complexity and dynamics mentioned above. This means that at the different stages of conflict and in different socio-economic and political circumstances, the mechanisms likely to establish sustainable development in a country or region require different developmental policy responses.

6.3.1.2 Sustainable Development

There is a particularly close relationship between environment and development in developing countries since the population in these countries is especially dependent on natural resources (soil, water, forests) and their sustainable use to survive. To achieve sustainable development as defined in the introduction of this chapter, one should bear in mind that development policy responses for environmental conflicts must go hand-in-hand with appropriate environmental policy responses. Strengthening a society's capacity to manage conflict without violence by means of development co-operation can be seen as a foundation for sustainable development. Therefore the following responses establish an explicit relationship between development co-operation in the service of sustainable development and the enhancement of peace and stability (WCED 1987 and Pearce 1989).

6.3.2 Responses

The following responses for development co-operation are amongst those which are most likely to fulfil the approach of sustainable human development, thus serving as a tool for the reduction of the potential incidence or escalation of conflict (DAC 1997). They encompass mechanisms to establish or to support the following policies:

(1) Development Co-operation;

(2) Decentralisation and Participation;

(3) Population Policy;

(4) Democratisation; and,

(5) Legal System and Human Rights.

6.3.1.3 Development Co-operation

Development co-operation is one important factor in the development and stabilising of framework conditions in developing countries, particularly those experiencing environmental stress. Development co-operation comprises a multitude of instruments. Some are directed towards strengthening internal socio-economic conditions in order to make a state less vulnerable to environmental stress. Others are directed at stabilising and improving the international economic position of the state in question.

One basic aim of bilateral and multilateral development co-operation is to alleviate poverty in order to reduce the potential incidence or escalation of conflict. In the context of environment and security this is of special relevance, as poverty is one of most often experienced direct consequences of environmental stress, and is likely to catalyse the incidence of violence. At the same time, poverty, increased resource dependency and economic vulnerability are important contextual factors which can influence the incidence of conflict due to environmental stress and its

consequences. Both reducing poverty as a consequence of environmental stress and as a contextual factor are central aims of development co-operation.

However, experts from the institutional framework suggest that on the aggregate level, official development assistance (ODA) given to developing countries is often unrelated to its poverty level. In some cases, higher ODA is apparently given to countries with bigger military expenditures and is not allocated to such priority human development concerns as education, health care, safe drinking water, nutrition, etc. (UNEP 1995). This model creates unnecessary debt burden and economic dependency for many developing countries and consumes their national budgets, limiting future investment into much-needed programs. Therefore future economic reforms should include those that adhere to sustainable development principles and that are co-ordinated at the various levels (international, regional, national, and local).

Listed below are examples of selected instruments of development co-operation which are directed towards strengthening the internal economic structure of a country and alleviating poverty. At the local and national level, the following initiatives can be implemented:

(1) Credits or grants to the respective government for the development of appropriate economic infrastructure;

(2) Promotion of private sector initiatives by encouraging entrepreneurial activities in agriculture, small-scale industry and trade;

(3) Support the creation of savings and credit groups for small-scale entrepreneurs; and,

(4) Support local training and employment opportunities.

Strengthening these internal structures should complement instruments applied on a bilateral and multilateral basis. At the international level, these structural economic techniques should include:

(1) Encouraging trade and the investment of private capital from industrialised countries in developing countries;

(2) Integrating developing countries into the world market;

(3) Opening of regional markets for products from developing countries; and,

(4) Multilateral approaches to debt relief.

These economic development measures should also have a positive affect on alleviating poverty. Additional examples of development mechanisms that can help alleviate poverty are as follows:

(1) Providing gender empowerment, general education, literacy and vocational training;

(2) Ensuring the basic infrastructure (water, sanitation, housing) and health services are available;

(3) Implementing self employment schemes and land reforms (UNEP 1995).

6.3.1.4 Decentralisation and Participation

Given the shortcomings of top-down development efforts, decentralisation and participation has come to be recognised as an absolute imperative for development not only within the alternative tradition, but also in many mainstream strategies. As UNCHS notes, "People have the right and duty to participate in the execution of projects which profoundly affect their lives" (UNCHS 1984: 6).

The strengthening of communal administrative authorities and decentralisation of governmental tasks can to a significant extent contribute to participation and democratisation processes. 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 enabling the society to incorporate participatory and democratic processes (OECD DAC 1997: 39-40).

Participation strengthens civil society and the economy by empowering individuals, communities and organisations to negotiate with institutions and bureaucracies, thus allowing civil society to influence public policy and to provide a check on the power of government. Participation also aids in dealing with conflicting interests in a peaceful manner, including instances resulting from the consequences of environmental stress. It follows that the creation of a climate and the capacity for constructive interaction between civil society and government is a critical component for long-term peace building.

Establishing regional and local autonomy and self-governmental structures can lead to the reduction of potential conflict causes. When participatory structures in a society include legal, political, cultural and economic issues, it allows all group members to join the decision process (community based approach).

The following measures may also support participation and democratisation processes.

(1) Encourage the decision-making role of the community;

(2) Ensure that policies correspond to the needs and conditions of the people to whom they are directed;

(3) Support local groups in planning, implementing and managing projects using their specific competencies;

(4) Provide specialised technical assistance and expertise in the field of decentralisation policies;

(5) Clarify functional responsibilities between central and local levels of government - includes support for the establishment of systems to allocate fiscal revenues and corresponding responsibilities;

(6) Strengthen organisational capacities of representative intermediary bodies, including regional parliaments and local councils;

(7) Strengthen the representation of marginalised groups in civil service posts; and,

(8) Support for training in conflict resolution and encouragement for establishing grassroots groups within civil society.

6.3.1.5 Population Policy

Since the Rio Summit in 1992, it has been widely recognised that meeting the needs and desires of a growing global population is exceedingly difficult. Without curbing rapid population growth and improving the development of a natural resource base, environmental degradation is expected to continue.

The impact of environmental stress in areas characterised by rapid population growth, chronic economic deprivation, and social stress is extreme. Competition for decreasing resources (soil, water, forest) among an increasing population raises the potential incidence or escalation of conflict. Furthermore, the competing groups are often the most vulnerable and poorest people in society who have to struggle for their survival. Environmental stress and rapid population growth often reinforce each other. Furthermore, overexploitation of and conflicts over resources in these regions lead to open conflicts in many cases. 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.

Developmental co-operation is a means to increase work in family-planning and improve the social economic circumstances of society. Some important developmental policies, which must be based on the participation and decentralisation concept as mentioned above, in this regard are:

(1) Projects for erosion control and water supply;

(2) Support the supply of agricultural means of production for rural peasants (e.g. more productive and improved species, plants and seeds, credits, and food security);

(3) Support policies that enable peasants offer their goods on the market (e.g. infrastructure, price-policy);

(4) Reduce population pressures on both cities and rural lands by addressing the reasons for rural-to-urban migration and encourage lower birth rates;

(5) Improve health and social services, education and employment (especially for women) in both rural and urban areas;

(6) Improve access to financial services and credit for rural dwellers to allow for the equitable distribution of land; and,

(7) Encourage social justice and gender (with an emphasis on improving the lives of women) (OECD DAC 1997: 30-31).

6.3.1.6 Democratisation

A society which enables all individuals and groups to articulate their interests and which provides the mechanisms to balance these interests has the prerequisites for dealing with conflicting interests in a peaceful way. This also holds also true in the case of environmental stress and its consequences. Support for democratisation, participation and the development of a civil society will help to establish such balancing mechanisms and enable the people to interact with these mechanisms.

Democratisation processes in countries must be more than simply the transfer of democratic mechanisms applied mainly by western industrialised countries. This is especially true in countries which lack a degree of information, citizen participation, and acceptance of a democratic system. Since these are necessary pre-requisites for democratisation, it is especially important to strengthen them, especially in societies characterised by diverse ethnic groups. It is important that the democratisation process takes cultural, historical and human contextual factors in consideration.

There are many options to promote democracy. They include mechanisms that strengthen civil society and institutional mechanisms:

(1) Mechanisms to Promote Civil Society:
   a) Strengthen public institutions (e.g. non-governmental organisations (NGO);
   b) Strengthen the public's access to information;
   c) Strengthen dialogue between and among groups at the local, national and regional level;
   d) Support marginalised groups and the most vulnerable.

(2) Mechanisms to Promote the Development of Institutional Capacity:
   a) Support constitutional reforms, including providing advice to governments on constitutional and legislative issues;
   b) Provide assistance to strengthen representative political institutions;
   c) Support legislative systems and electoral processes, including educating the electorate about their rights, election monitoring, analysis and monitoring of its electoral processes;
   d) Provide assistance for the organisation of elections and referendums;
   e) Provide assistance for the organisation of other democratic institutions (e.g. courts, legislative bodies and the executive) (OECD DAC 1997: 40, 48).

6.3.1.7 Legal System and Human Rights

All efforts to strengthen the prevention of environmental conflict and the peace building through development co-operation are conditioned to some extent by the legal environment in which they are imbedded.

An independent judiciary that is accessible to all societal groups is important for the protection of human rights (codified by national law) and can contribute to avoiding undesirable power structures or the reinforcement of stratification within a society caused or nourished by environmental stress. At the same time, a positive attitude and support of the government and public authorities towards an independent and accessible judiciary are preconditions for its proper functioning.

At the same time, the maintenance of local and indigenous legal institutions must be matched by a commitment on the part of government to meet citizens' basic needs and safeguard their basic rights. Aid should be proactive in helping to develop and maintain mechanisms that honour basic human rights, improve non-discriminatory access to legal and judicial services, and facilitate the peaceful resolution of disputes.

Despite the trend to internationalise human rights issues, the protection of human rights is still a task mainly in the hands of states. An interactive relationship between the state and the civilian population could pave the way for reducing the abuse or neglect of human rights. In situations where governmental actors neglect human rights, appropriate training should be considered as a possible mechanism. Human rights training could be directed towards the military, community leaders, police, educators, judiciary, de-mobilised combatants, legal and paralegal professionals, paramilitary groups and prison personnel.

Human rights training must be tailored to country-specific situations, based on internationally accepted principles as established in international human rights conventions. It is widely acknowledged that women, children and youth often bear the brunt of the consequences of conflict both domestically and in the wider social context. (OECD DAC 1997: 1997) Therefore, human rights training should also target gender-specific concerns and issues.

In addition to the provision of training, logistical support, equipment and infrastructure may be needed to assist the development program in operating successfully. Justice and dispute settlement mechanisms must also integrate respect for and promote human rights as fundamental principles. Development co-operation should aim to contribute to strengthening institutions and training personnel who have a role in protecting human rights and managing conflict.

Assistance to implement or strengthen a legal system should focus on:

(1) Formal law and justice institutions (e.g. courts, law reform commissions, civilian police forces);

(2) Communal, traditional law enforcement/dispute resolution structures and groups;

(3) Other agencies which operate in areas that have to face conditions of communal conflict (e.g. resource management authorities); and,

(4) Facilitating access to legal systems for individuals and groups, especially for those who are marginalised. (OECD DAC 1997: 41-44)

6.3.3 Conclusion

Multilateral and bilateral development co-operation is one approach to preventing conflict and ensuring sustainability. Economic decline or rapid economic growth may intensify tensions and contribute to the potential incidence or escalation of conflict. There is therefore a need for shared approaches to development co-operation among the various international donors and regional level bodies to prevent conflict and stabilise peace building.

The various institutions in the global community are asked to continue improving the different responses mentioned above. The need to scale up popular development initiatives implies turning attention not only to national political structures, but also to developing sound long-term macroeconomic stabilisation plans and continual financing for projects. This involves the need for improving the methods for organisations and related groups to exchange information, to create and maintain feasible budgets for project implementation, to adopt common approaches for economic and aid co-ordination, and to provide mutual support. It also entails building new forms of international co-operation via the reform of existing global institutions and for all donors to improve common standards for safeguards preventing negative social impacts from development projects. The introduction of safeguards that are similar in function (such as the World Bank's Directives on Environmental Impact Assessments and Operational Directives on Resettlement and Indigenous People) could be enhanced within the donor community.

The means of collaboration will vary according to the actors involved and the specific aspects of development being addressed. In general, there is great potential to increase international co-operation, including North-South and South-South. There is a call for integrated

regional approaches whereby states can work with regional organisations and other groups such as NGOs to create greater regional economic co-operation (OECD DAC 1997:98).

Given the different historical and geographical conditions faced by developing countries and countries in transition, strategies of international participation should stress flexibility. In order to achieve this, it is particularly important to understand the conditions under which global linkages (i.e. trade, capital flows, migration) are productive or counterproductive to particular social groups and society as a whole.

6.4 Foreign and Security Responses

As environmental conflict is a cross-sectoral issue, it also calls for foreign and security policy responses in order to prevent escalation or to resolve the underlying environmental stress, its consequences or contextual factors. The aim of the responses enumerated in the following is to establish as many links as possible between the fields of environmental policy and foreign and security policy. This global, integrative and co-operative approach includes contributions of foreign policy and security organisations' specific instruments and mechanisms that can support the prevention or resolution of conflicts.

6.4.1 General Principles

6.4.1.1 Conceptual Linkages

The relationship between environmental stress and security is reflected in the varying methodological frameworks that are used by different communities and institutions for case analysis (Deudney 1991 and Brock 1992). An effective analysis will need to strike a balance amongst these approaches. Research on the relationship between environmental stress and security has shown that while environmental stress may be an important structural, trigger or catalytic factor impacting security, it almost never operates in isolation from other causal factors. As one potential factor among several, environmental stress should be included as part of an integrated analysis and should not be treated separately.

One implication of undertaking this more integrated and robust analysis is the need to access more specialised information and expertise. By enhancing co-operation among environmental, development and foreign policy and security institutions, each gains access to the technical knowledge and mechanisms of the others and allows the institutions to provide their respective fora and operational capabilities in support of activities along the conflict dynamic. Heretofore, co-operation amongst this set of actors was not highly developed. The result is that the creation of new, specific security mechanisms to deal with environmental issues may not be a necessary course of action. In some cases environmental stress may stimulate the principal disputants to seek co-operative solutions, reduce tension and avoid conflict. Environmental stress often contains the seeds for both conflict and co-operation. In these cases, co-operation among environmental, development and foreign policy and security institutions can enhance and strengthen the positive activities of the parties involved through the provision of confidence building measures, such as treaty monitoring, short-term stabilisation programs and impartial adjudication.

6.4.1.2 Integrative and Co-operative Approach

In developing foreign and security policy responses, the following general principles have been identified:

(1) Account for the relevant environmental conditions in formulating security policies;

(2) Enhance co-operation and interaction amongst existing foreign and security organisations, based on their respective charters, missions and capabilities;

(3) Promote co-operation amongst environmental, development and security institutions and other stakeholders;

(4) Integrate each actor or institution according to its own competencies and on the basis of comparative advantage;

(5) Encourage communication among foreign and security policy actors and institutions and relevant stakeholders within civil society;

(6) Take a precautionary approach in the development of policy responses; and,

(7) Use an integrated methodology to develop risk assessments, ensuring that the analysis accounts for the spectrum of factors and that responses give priority to future considerations.

These principles form the basis for following categories of foreign and security policy responses.

6.4.2 Responses

A number of actions can be undertaken in response to the potential impact of environmental stress in the security context. As such, potential policy responses have been separated into seven categories. The categories cover a range of potential responses addressing the breadth of the conflict dynamic. The categories group together opportunities for intervention along the course of the conflict dynamic, beginning with early warning and preventive activities and ending with long term remedial and stabilisation projects. As security institutions and actors formulate a response it is important for them to include other institutions and actors who may already, or will potentially be engaged in activities which impact on the security context. The seven categories are:

(1) Characterisation of environmental conditions which could be at the root of a conflict;

(2) Integrated assessment of an environmental issue;

(3) Early warning;

(4) Preventive diplomacy;

(5) Permanent mechanisms of dispute settlement;

(6) Crisis management; and,

(7) Post-crisis management.

For each of these stages, foreign and security policy responses can be identified. Other stakeholders, mainly in the field of environment and development, should actively be engaged in the process.

6.4.2.1 Characterisation of Environmental Conditions

Information sharing and co-operative development are key measures. International and regional monitoring systems based on available data from different types of organisations (environmental, scientific, technical) should be developed, and scientific and technical programs on the characterisation of environmental conditions. Security organisations should contribute to information sharing on the basis of available data in national and multilateral security institutions, including remote sensing data, according to their respective mandates.

6.4.2.2 Integrated Threat Assessment

The development of an integrated assessment requires co-operation among environmental, development and security actors and institutions. Security institutions

should increase their awareness of the links between environmental stress and security. As such integrated assessments should address:

(1) Global and reciprocal interaction among environmental, political, social, economic, demographic, financial factors and interventions;

(2) Information and expertise from civil society;

(3) Dialogue and co-operation between national and multilateral organisations;

(4) The process of developing integrated assessments should include the establishment of regular interaction and consultation with different field organisations based on the concept of co-operative security and aiming at the promotion of information sharing and synergy.

6.4.2.3 Early Warning

Methodologies and mechanisms for early warning should be developed among existing institutions. For example, the OSCE demonstrates that these systems require (Broadhead 1997):

(1) Regular political consultation within the security organisations;

(2) Examination of the respect of commitments taken in the framework of these organisations; and,

(3) Search for significant underlying causes of tension.

These mechanisms should be developed not only inside organisations but also by increasing the links between organisations and partners. In this regard, apart from OSCE, European security institutions have developed useful frameworks such as NATO's Euro-Atlantic Partnership Council, the special relationship with Russia, the special relationship with Ukraine and the Mediterranean Co-operation Group. In order to establish communication and exchange among security organisations and other relevant actors in the field of environment, the opportunity to designate, within security organisations, an official responsible for such a task could be discussed. The "Mandate for a Co-ordinator of OSCE economic and environmental activities" is a good example of such an approach.

6.4.2.4 Preventive Diplomacy

The most difficult problem for preventive diplomacy in conflict scenarios is the difficulty in disentangling environmental change from the inherent risks created by the effects of environmental stress. Should diplomacy target the environmental trigger, the political, economic and social consequences, or the security implications? Indeed, there are several appropriate points for intervention, each addressing different aspects of the problem: dealing directly with environmental stress factors; the political, economic, social and demographic consequences of environmental stress and changes to the security context.

Addressing the range of potential interventions requires a robust interaction among security, development and environmental institutions and actors.

Most of the case studies show how the potential rewards of external financial and technical co-operation, whether from national or international sources, positively influences the actors. The promise of large scale economic co-operation, technology transfer, and financial investment and co-operation has proven to be a strong motivator for many developing countries. Bilateral and multilateral donors should support stabilising measures including financial co-operation, and the prospect of development projects that may have a positive impact on regional security.

As far as security institutions are concerned, they could use their existing prevention and dialogue mechanisms to address the security impact of environmental issues, capitalise on the catalytic function of environmental co-operation for confidence building, and enhance dialogue and co-operation among themselves. In the European case, OSCE has already demonstrated its capability in preventive diplomacy through its existing

missions, assistance group and liaison bureaux. These missions should have the capability to engage parties who are effected by environmental stress. 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 special relationship with Ukraine, all provide opportunities for consultation and preventive diplomacy.

For preventive diplomacy to be effective in confidence building among stakeholders, certain preconditions should be met:

(1) The recognition and acceptance of a shared problem among the parties involved;

(2) The recognition that solving such a problem transcends national capacity; and,

(3) The recognition that they should be addressed in multilateral frameworks.

Established regional organisations can offer a useful co-operative structure which can address issues of environmental conflicts. Moreover, environment can be used as a catalyst for broader co-operation at regional or sub-regional levels. Existing agreements or mechanisms in the environmental field, which already created a degree of co-operation among states in a region, can be taken as the basis for a larger political, economic and security co-operation. The activities developed in the framework of the Council of the Baltic Sea states illustrate the validity of such a process, which could be duplicated in other contingencies.

6.4.3 Dispute Settlement and Conflict Management

6.4.3.1 Permanent Mechanisms of Dispute Settlement

The existing mechanisms of mediation, dispute settlement, conciliation and arbitration in the foreign and security field can be employed in conflicts where environmental stress and its consequences may be contributing issues (Baechler 1998). Existing mechanisms that could be used include:

(1) Mechanisms of dispute settlement already included in many environmental regimes;

(2) The International Court of Arbitration;

(3) The OSCE convention on conciliation and arbitration of 1992; it rests upon two main activities: conciliation, which can be triggered by different categories of actors; arbitration, which takes place in case of failure of conciliation;

(4) The appropriateness of ad-hoc conflict resolution measures should also be examined.

6.4.3.2 Crisis Management

In the event of the failure of both preventive and dispute resolution mechanisms, security organisations take on a central role in the management of crises. At the same time, environment and development organisations should maintain their co-operative efforts and provide support to the resolution of the crisis. In the European case, considering that NATO has acted under UN and OSCE provisions and supervision in peacekeeping operations, given the proper mandate from the UN Security Council and the agreement of the NAC it may take on a similar role in the case of conflict with an environmental component.

6.4.3.3 Post-crisis Management

Reconstruction and rehabilitation after an environmental conflict require the same types of tools as in other crises. As the crisis fades, the centrality of security institutions is gradually replaced by the co-operative relationship among environmental, development and security actors and institutions. Development programs, which reduce environmental stress and strengthen institutional capacity should be encouraged. High priority should be given to continue or restore the development process. The international donor community can, through short-term stabilisation projects,

demonstrate the potential advantages of de-escalating or resolving the conflict. In the post-crisis management stage, a monitoring process, which includes environmental, political, economic, social and demographic factors and the perceptions of threat should be establish ed as a long-term stabilisation measure.
An integrated analysis of the crisis will better define the scope of monitoring activities.

Acquisition of data about the state of the environment and its distribution to the parties involved are critical issues. Post-crisis management mechanisms should also evaluate the environmental stress generated over the course of the crisis and its resolution. Furthermore, it should consider the social, economic, demographic and political consequences which result from environmental stress.

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