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**Envisioning the Global  
Environment in 2025**

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### Synopsis or Abbreviated Abstract

In 1998, General Motors began a cooperative envisioning project with the Greening of Industry Network (GIN) to develop a shared understanding of the forces of global environment change in 2025. The initial phase of the project identified 36 forces of environmental change themes. The current phase examined the relative importance of these 36 themes and the attention given to them by thought leaders from around the world.

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## **ABSTRACT**

One of the challenges facing decision-makers today is to anticipate and respond to new pressures in the changing global environment and the emerging needs of society. Identifying potential future pressures can be a valuable way for business, government, industry, academia, and other organizations to prepare for a sustainable future. For that reason, General Motors began a multi-year cooperative envisioning project with the Greening of Industry Network (GIN) in 1998 to develop a shared understanding of the forces of global environment change in 2025.

The first phase of this envisioning project was a survey that identified 36 forces of environmental change themes. A second survey was conducted to interpret the relative importance of these 36 themes and the attention given to them on a country-by-country basis. In addition, initiatives that GIN should undertake to assist in addressing each of the themes were solicited. The surveys were sent to environmental thought leaders from all regions of the world.

Twelve themes covering a wide variety of areas (i.e., mobility, business cooperation, human settlement, etc.) were rated as of major-to-critical importance to respondents' countries. Three of these top 12 importance themes dealt with mobility issues: vehicle performance, alternative transportation, and increasing mobility. Variations in importance ratings were found between developed and less developed countries as well as among the global regions. Theme differences were also noted among the four affiliations of the environmental leaders: academia, government, industry, and non-government organizations.

Initiatives suggested for GIN to pursue that will address these forces of environmental change were grouped into similar areas. Most of these suggestions complied with GIN's mission to stimulate, coordinate, and promote research consistent with building a sustainable future. Other initiative areas included promoting improvements in environmental education and individual awareness, professional networks, information access, and the like.

The perceptions and opinions from the survey respondents are extremely valuable because they reflect future environmental issues and drivers as seen through the eyes of key thought leaders around the world. The results of these two surveys may not accurately predict future environment issues, but they do serve to frame the debate and identify major environmental drivers at this point in time. The findings endorse the need to continue with planning for the second decade of the Greening of Industry Network.

## **PURPOSE OF THE RESEARCH**

Two surveys were conducted as part of the cooperative "Envisioning the Global Environment in 2025" project with the Green of Industry Network (GIN) to provide information about the importance of and the attention given to 36 forces of environmental change themes. The project provides insights from academics, government officials, industrial and business leaders, and non-governmental organizational members into global and regional environmental issues and trends.

## **CONCLUSIONS**

Twelve themes stood as being seen as having major importance to respondents' countries:

- Changing Operating & Management Philosophies
- Education's Increasing Role
- Expanding Awareness of Environmental Issues
- Impact of Advanced Technologies
- Improving Vehicle Environmental Performance
- Increasing Levels of Consumption
- Increasing Mobility & Degradation
- Increasing Use of Environmental Business Practices
- Interest in Alternative Energy Sources
- Need for Global Environmental Collaboration
- Shifts to Alternative Forms of Transportation
- Urban Planning & Land Use

The importance and attention given to the forces of environmental change varied by region of the world. Most diversity of opinion involved themes of shifts to alternative forms of transportation and the environmental degradation associated with increasing mobility. Yet, being mobile is viewed as essential. Responses from the various global regions also varied on the importance given to themes concerning business cooperation to improve environmental performance.

Thought leaders representing academia, industry/business, government, and non-governmental organizations (NGOs) all view the need for global environmental collaboration and the changing of business philosophies as themes of major-to-critical importance to promote a sustainable future. Only government respondents rated New Health Risks and the Emerging WorldView as highly important themes. This is likely because government agencies are more often responsible for determining health-based standards for new chemicals and regulating materials. In addition, industrial affiliates alone rated the theme of growing consumer interest in environmental products and processes as very important for a sustainable future. This may indicate that business sees an increasing demand for more environmentally responsible products in their marketing research.

The initiatives suggested by respondents for the Greening of Industry (GIN) to undertake were consistent with GIN's mission to stimulate, coordinate, and promote research that conform to building a sustainable future.

## **SIGNIFICANCE**

The information that was gathered in this project reflects the importance that thought leaders from difference global regions attach to various forces of global environmental change.

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## **INTRODUCTION**

One of the challenges facing society today is to integrate environmental, social, and economic objectives under the sustainable development banner. Individual companies are being judged by their total environmental impact and progress toward sustainable development goals. Identifying future forces of environmental change can be a valuable tool for achieving sustainable development. The Greening of Industry Network is one group that is working to achieve these goals.

### **Greening of Industry Network**

GIN is a research and policy network dedicated to building a sustainable future. The Network's mission is to stimulate, coordinate and promote research of high quality, relevance, and usefulness ensuring that the activities of industry - including business, labor, consumers, government and others - are consistent with building a sustainable future. GIN comprises over 1500 individuals representing academia, business, public interest, labor, and government from more than 50 countries. Because of this global diversity, GIN is able to offer unique insights into upcoming needs for environmental research and public policy directions.

### **Project Overview**

In 1998, GIN began an important multi-year collaborative project in cooperation with General Motors to develop a shared understanding of the future global environment. The project is called "Envisioning the Global Environment in 2025." GIN and GM sponsored this project to better understand the evolution of environmental issues over the next 30 years and to see how GIN can contribute even more to achieving a positive future global environment. The process consisted of two surveys (1 and 2) to identify and elucidate these environmental forces. Survey 1 was used to identify the major environmental themes over the next 30 years, and Survey 2 built on the results of Survey 1 by examining the importance of each theme.

## **METHODOLOGY**

### **Survey 1**

Survey 1 was distributed in June 1998 over the Internet to GIN members and other environmental thought leaders. The survey asked respondents to list the forces of change that will positively or negatively impact the global environment by the year 2025. Typically, forces of change may be found in society, technology, energy, regulation, economics, business, and other areas. Examples of forces of change identified in other research studies included changes in fresh water supplies or air quality, changes in standards of living or economic polarization of society, and changes in world or country population profiles. We also asked respondents why they selected the particular forces of change and to project their potential impact on the environment.

From the responses to Survey 1, we identified 36 forces of change themes that might impact the future environment. The 36 themes were grouped into 17 major theme categories. These interim project results were presented at the Greening of Industry Network 7<sup>th</sup> International Conference, November 15-18, 1998, in Rome Italy, as part of a plenary session titled "Research Agenda for the 21<sup>st</sup> Century."

Following Survey 1 and as part of our continuing analysis, the theme categories were refined and reduced to 10. Table 1 lists each of the 36 themes and the categories to which they were assigned. (A more complete listing by category and theme along with a description of each theme may be found in the Appendix).

## **Survey 2**

Survey 2 was distributed to GIN members in October 1998. Survey 2 built on the results of Survey 1 with the goal of furthering an understanding of the views of countries on environmental issues. This survey was aimed at interpreting the importance of the 36 forces of environmental change themes on a country-by-country basis. For each country, we developed a customized survey form containing the 36 themes, a synopsis of each theme representing the collective perception of responses received from all countries, and the text of the Survey 1 responses from that country for each theme.

In Survey 2, we asked respondents to add comments to each theme, indicate the importance of the theme to their country, and indicate how much attention is being given to the theme in their country today. In addition, Survey 2 asked respondents to indicate if GIN should undertake initiatives around particular themes and to suggest examples of specific initiatives that would be valued by the respondents' country. Finally, respondents were asked to identify any additional forces of change in their country that were not captured in the analysis of Survey 1.

Individuals from thirty-two countries responded to Survey 2, and a graphic indicating those countries is shown in Figure 1. The respondents represented eight regions of the world: Western Europe (9 countries), Asia and the Pacific (7 countries), Eastern Europe and Central Asia (4 countries), Latin America and the Caribbean (3 countries), Northern Europe (3 countries), North America (2 countries), and sub-Saharan Africa (2 countries). In addition, these respondents reflect (1) developed countries, (2) less developed countries, and (3) developing countries. The largest portion of Survey 2 responses came from developed countries (72.2%) followed by less developed countries (24.5%) and developing countries (3%). Table 2 summarizes demographic information about Survey 2 respondents.

The responses to Survey 2 gave us a tremendous amount of data to process. First, we analyzed the distribution of importance and attention assigned to the 36 themes from Survey 1 by all respondents (see Figure 2). In this graph, the X-axis shows the relative importance of each theme on a scale of 1 (Does not pertain to my country) to 5 (A critical theme in my country). The Y-axis rates the attention given to each theme on a scale of 1 ((Not being addressed at all) to 5 (Being addressed very effectively). Responses indicated that all the themes were rated as needing more attention. Therefore, we focused on the importance ratings for each of the themes. The themes garnering an overall major importance rating are reviewed and comments from respondents are highlighted in the Results section of this report.

Next, we examined rating differences in the importance of the 36 forces of environmental change for respondents from less developed countries. We compared them with those of respondents from fully developed countries. Table 2 contains for a listing of the countries in each classification. Discussions of the key themes are in the Results section. We also examined rating differences among the 12 key importance themes for the four professional affiliations: Academia, Industry, Government, and Non Government Organizations. In addition, we reviewed rating difference by the global regions.



The survey results were also analyzed in other ways to understand some of the viewpoints being expressed by the respondents. Several themes ranked as being the least important were useful in understanding some of the biases of the respondents. We also grouped into nine categories the initiatives suggested for the Greening of Industry Network to pursue. Finally, we analyzed the other forces of change that were identified by Survey 2 respondents.

**Table 1. Forces of Environmental Change by Category**

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**Biosphere**

- Heightened awareness stimulated by environmental disasters
- Growing concerns for water supply and air quality
- Growing concern for the loss of bio-diversity stemming from diminishing natural resource reserves
- Growing belief that an accelerated rate of global warming is occurring
- Growing benefits of eco-tourism
- Increasing varieties of new health risks

**Business Cooperation**

- Increasing use of green business practices
- Changing business operating and management philosophies
- Increasing business collaboration and networking

**Economics**

- Changes in economic conditions
- Increasing levels of consumption
- Growing consumer interest in greener products and processes
- The impact of the rising status of women on the environment

**Education/Awareness**

- Expanding awareness of the changing environment
- Education's increasing role in the environmental movement
- Emerging world view of people and their place in the environment

**Energy**

- Concern is growing as to the value and viability of alternative sources of energy
- Changing fossil fuel prices affect its use

**Human Settlement**

- Changing population size
- Changing population demography
- Growing urban population and urban sprawl
- Changes in where work is located
- Change in emphasis on planning for urban and rural land use

**Mobility**

- Increasing interest in mobility and the resultant increase in environmental degradation
- Improving environmental performance of automotive vehicles
- Shifts to alternative forms of transportation

**Non Government Organizations (NGOs)**

- Expanding influence of non government organizations (NGOs)

**Politics**

- Growing need for global environmental collaboration
- The impact regional alliances have on environmental legislation
- Emerging need for increases and improvements in environmental legislation
- Changes in political interest in environmental issues
- Emerging need for market-based environmental policies
- Threats of war

**Technology**

- The expanding information age is having a positive impact on the environment
  - Technology advances are improving the greenness of products and processes
-

**Table 2. GIN Survey 2 Respondent Demographics**

---

<b>Affiliation</b>	
Academia	49%
Industry	17%
Government	23%
Non Government Organization	11%
<b>Gender</b>	
Men	73%
Women	27%
<b>World Region</b>	
Asia & the Pacific	16%
Eastern Europe & Central Asia	6%
Latin America & Caribbean	3%
Middle East, North Africa & India	3%
North America	25%
Northern Europe	3%
Sub-Saharan Africa	3%
Western Europe	38%
<b>Development Category</b>	
Developed Countries	72%
Less Developed Countries	28%

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Note:

<b>Region</b>	<b>Country</b>
Asia & the Pacific	Australia, Japan, Korea, Singapore, Solomon Islands, & Thailand
Eastern Europe & Central Asia	Estonia, Greece, Poland, & Romania
Latin America & Caribbean	Brazil, Colombia., Trinidad & Tobago
Middle East, North Africa & India	Israel & Lebanon
North America	Canada & United States
Northern Europe	Finland, Norway, & Sweden
Sub-Saharan Africa	Seychelles & South Africa
Western Europe	Austria, Denmark, France, Germany, Italy, Netherlands, Portugal, Switzerland, & United Kingdom

**Table 3. Classification of Countries by Developmental Category <sup>1</sup>**

<b>Fully Developed Countries (World 1)</b>	<b>Less Developed Countries (World 2 &amp; 3)</b>
Australia	Brazil
Austria	Colombia
Canada	Estonia
Denmark	Greece
Finland	Korea
France	Lebanon
Germany	Philippines
Israel	Poland
Italy	Portugal
Japan	Romania
Netherlands	Seychelles
Norway	Solomon Islands
Singapore	South Africa
Sweden	Thailand
Switzerland	Trinidad & Tobago
United Kingdom	
United States	

<sup>1</sup> Based on Coates, Mahaffie, & Hines (1996).



Figure 1. Countries responding to Greening of Industry Network Survey 2.

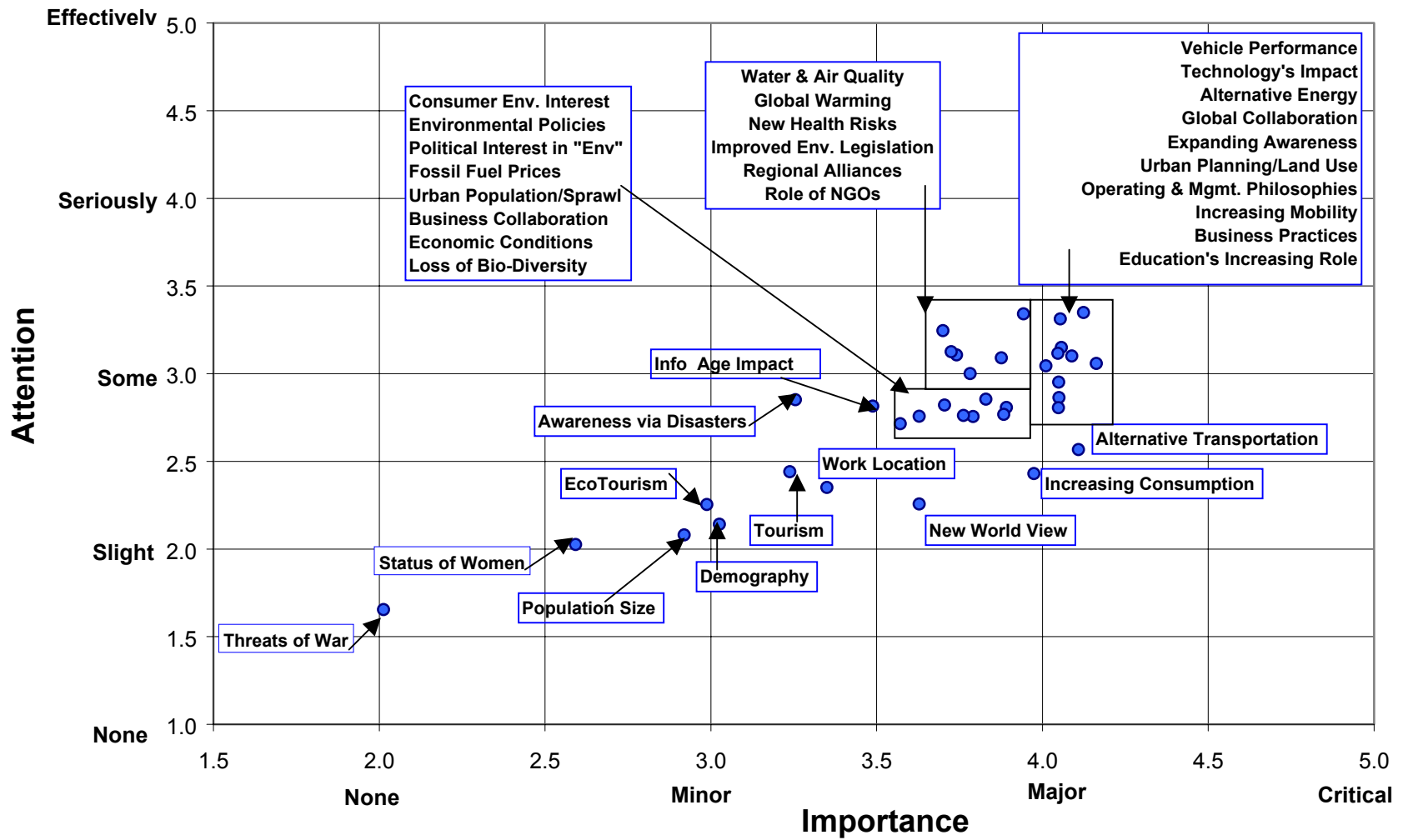


Figure 2. GIN Survey 2 Forces of Environmental Change Themes Importance-Attention Matrix.

## RESULTS AND DISCUSSION

### THEMES OF MAJOR IMPORTANCE

Survey 2 participants were asked to rate the 36 forces of environmental change themes identified in Survey 1 by the importance of the theme to their country and by the attention that the theme is given in their country. (See Figure 2.) For the entire sample, 12 of the 36 themes stand out as being seen as having major importance to respondents' countries (mean importance rating greater than 4.00; range 1 to 5) as well as not receiving enough attention. These 12 themes represent eight of the ten broad categories into which the forces of environmental change fall. (See Table 1.)

For the entire group of survey respondents, the top 12 themes, grouped by category, are listed below:

#### **Mobility**

- Improving Vehicle Environmental Performance
- Shifts to Alternative Forms of Transportation
- Increasing Mobility & Degradation

#### **Business Cooperation**

- Increasing Use of Environmental Business Practices
- Changing Operating & Management Philosophies

#### **Technology**

- Impact of Advanced Technologies

#### **Education/Awareness**

- Expanding Awareness of Environmental Issues
- Education's Increasing Role

#### **Energy**

- Interest in Alternative Energy Sources

#### **Politics**

- Need for Global Environmental Collaboration

#### **Economics**

- Increasing Levels of Consumption

#### **Human Settlement**

- Urban Planning & Land Use

#### **Mobility**

*Improving Vehicle Environmental Performance* Recent global public opinion polls (Environics, 1998, 1999) reveal that a majority of people around the world believe that automotive industry is a major contributor to environmental pollution. Therefore, it is not surprising to find that our survey respondents rate this as of major importance and needing more attention in their countries. Some commented that vehicle emissions are responsible for a substantial portion (20-25%) of the air pollution in their countries, especially in urban areas. Global warming was perceived as a real threat, and vehicles, urban planning, and low fossil fuel prices were mentioned as the key elements in the climate change crisis.

Comments from respondents suggest that moving away from fossil fuels and developing on-board energy storage is critical to solving environmental pollution associated with transportation in their countries. One suggested that the automobile is the worst technology, from an environmental perspective, ever invented. Further, some believe that the automotive industry is not sensitive enough

to deal with its impact. Although current changes will minimize emissions, they suggest that these improvements will not solve the environmental problems associated with traffic density and congestion. They believe that we need to change the mind set from "more efficient autos" to getting rid of them altogether. They feel that a major paradigm shift is needed which will restructure communities to reduce dependence on cars.

Others, however, recognize that the automobile is still the most important means of individual transportation and is likely to remain so for the foreseeable future. Therefore, improvements in emissions are essential for the environment. Even so, it is important only if cost-competitive improvements can be developed because consumers are not willing to pay more for these improvements.

*Shifts to Alternative Forms of Transportation* Although respondents rate this theme as of major importance to their country, they report that it does not receive nearly enough attention. A majority of Survey 2 respondents commented that shifts to alternative forms of transportation are not occurring at all in their countries. If anything, they report the emphasis on private vehicles is increasing. Moreover, some said that public transportation has a decreasing share of the growing transportation sector in their country. The reason cited is that low fuel prices depress interest in alternative forms of transportation.

For North America, the shift will take time because drivers do not want to give up the independence associated with a private vehicle. Individuals in the US and Canada reflect this sentiment. It was suggested that North Americans would use mass transit to commute and shop only if it is quick, convenient, and economical. On the other hand, Western Europeans said that the shift away from personal transportation towards mass transit is well underway. Bicycle use is booming in the European Union. Even so, the Western European view was in the minority.

A few respondents mentioned that alternative forms of transportation are emerging mostly in large urban centers where the shift from private to public transit has the most beneficial impact. These individuals suggest that their countries have introduced a wide range of policy measures to promote this shift toward reliable, affordable, and convenient public transit. Even so, they admit this shift will be difficult to make.

*Increasing Interest in Mobility and the Resultant Increase in Environmental Degradation* Most respondents acknowledged that mobility is increasing and that this is an issue of major importance in their country. Many acknowledged that there is an associated impact on the environment from increased mobility. Yet, some mentioned that being mobile is essential and that the impact is unclear. Still others pointed out that this mobility issue is a broad one that includes leisure activities such as vacation travel, pleasure boating, and other forms of recreation.

## **Business Cooperation**

*Increasing Use of Environmental Business Practices* Most respondents commented that businesses were increasing the use of practices to become more efficient and environmentally friendly. ISO14000 was cited as one typical environmental management system that companies were implementing. Many respondents, however, felt the pace of adopting environmental business practices was modest and slow. Some noted that only economically viable "green" practices will survive.



A few noted that more firms are publishing environmental reports. Many companies (mainly large-scale) are viewed as recognizing that environmentally sound business practices can offer a competitive advantage. Yet, some said that these practices were adopted not for the environment *per se*, but because of competitiveness and enhanced company image. Others said that these environmental business practices are adopted to avoid stricter environmental policies that could be introduced by legislation.

*Changing Business Operating and Management Philosophies* A majority of the respondents see changes in operating and management philosophies by businesses in their country. However, many commented that this change was still primarily associated with economics or in business sectors that would gain an advantage. Most consider this to be a slow change.

Business philosophies are changing as businesses are beginning to consider how to measure and manage environmental issues. Some commented that until proactive management of environmental issues is ingrained in business philosophies and environmental performance is seen as an opportunity rather than a business threat, few companies will move beyond compliance. Clearly, many of the respondents view business attitudes toward the environment with cynicism and feel that industries will improve their environmental performance only in response to legislation and public pressure.

## **Technology**

*Technological Advances are Improving the Environmental Impact of Products and Processes* Most respondents acknowledged that some environmental improvements in products and processes are occurring in their countries based on advances in technology. In general, many felt that technology provides the means to address environmental problems in a way that businesses can make a profit. Yet, respondents recognize that the full potential has not been realized and more is needed to transform markets which encourage "dirty" operations, especially in developing countries. Some suggest that this theme may be more important in the future as the use of clean technologies gains widespread adoption.

Yet, others feel that reliance on technology postpones the need to change behavior or to develop new forms of self-governance toward the environment. Several felt that the importance of new technologies in addressing environmental problems is less than the public relations departments of companies would suggest. One European respondent stated that some technological advances are good for the environment, whereas other advances are bad; the specific example given was the controversy over genetically engineered foods with their unforeseen drawbacks.

## **Education/Awareness**

*Expanding Awareness of the Changing Environment* In general, awareness is recognized as an effective tool and driver for protecting the environment. Even so, many commented that awareness appears to be leveling off or declining in some regions. Some stated that other problems (i.e., economic, social, etc.) are more important than environment in some locations today. Others mentioned that while awareness is increasing, it is not bringing changes in consumers' behavior.

Awareness must be tied to a fundamental concern of the consumer to generate real action at a personal level. In other words, awareness is still at the "them" level, not the "me" level for both

individuals and organizations. Some see that "most organizations are waiting for others to take initiative in this area rather than taking a leadership role."

*Education's Increasing Role in the Environmental Movement* Environmental education has been integrated into all levels of education for many years, at least in the United States. However, many say that environmental education has a lot of room for improvement and, at present, is relatively ineffective in some regions. Some suggest that it is just for "greenies," while others say that we need to ensure that environmental literacy is built into all types of education especially business, engineering, and occupational training. Only then will environmental education yield long-term benefits.

## **Energy**

*Concern is Growing as to the Value and Viability of Alternative Sources of Energy* In general, alternative energy sources are viewed as a long-term goal because of the current easy availability and lower cost of fossil fuels in many regions. Possible alternative sources suggested include solar, hydro, wind, and geothermal. Some suggest that it is all about energy prices and the economic situation. In areas where the environment or the remoteness of communities promotes the development of alternative energy technologies, progress is greater. A major constraint is the ability to fund the large capital investments required to support the infrastructures necessary for alternative energy sources.

## **Politics**

*Growing Need for Global Environmental Collaboration* In general, respondents agree that collaboration is necessary to handle pervasive environmental problems. Individual countries recognize that they could benefit greatly from sharing environmental technology through global collaboration. Some consider collaboration critical because unitary action will have little effect on a global scale. However, some see no real action. One respondent recognized that some countries do not want others telling them what they must do for the global environment. Others are concerned that efforts of specific groups, such as industries or less developed countries, will impede collaboration on global environmental concerns.

## **Economics**

*Increasing Levels of Consumption* Most respondents recognize that increasing consumption is an environmental concern that does not necessarily apply to their country because of economic reasons (i.e., under developed, economic down turns, etc.). Many others commented that consumption is high and rising. Yet, some thought that it has peaked in their country and that people are reducing their consumption. For a minority, consumption linked with environmental awareness has led to shifts towards more environmentally friendly lifestyles. Others see that increases in material consumption eat up most of the efficiency gains. One example of this is the tendency to shorten the useful life of a product to stimulate recurring demand for the product.

## **Human Settlement**

*Change in Emphasis on Planning for Urban and Rural Land Use* Most respondents agree that this is an important issue that needs more attention. Some said that towns are "greening" and farmers are

becoming paid "Environmental Managers". Others say that both positive (i.e., nature preservation along rivers) and negative (i.e., infrastructure) development occurs.

Some reported that the emphasis on change in this area is currently not happening in their country. For some, they have had a strong emphasis on urban and rural planning for some time. The increasing political and financial clout of the public and non-profit organizations appear to be having an importance influence on planning and how land is used for governments and developers. For example, the Sierra Club in the United States has adopted the reduction in urban sprawl as one of its focus areas.

On the other hand, some feel that the subsidies given to agriculture and resource extraction industries result in continued environmental degradation. Still others see this theme as being tied to an issue of increasing personal wealth. This leads to an increasing number of people with enough money to have two homes, one urban and one rural; in turn, this leads to an ever-growing encroachment on the green belt.

### **Synopsis of Top Themes of Importance**

In summary, GIN Survey 2 respondents find a wide variety of forces of environmental change in the future are of major importance to their countries. These forces cover mobility, business cooperation, technology, education/awareness, energy, politics, economics, and human settlement. Among the themes for the top 12 forces of change are all three mobility themes: Increasing Mobility, Improving Vehicle Environmental Performance, and Shifts to Alternative Transportation. From a global perspective, we interpret this to mean that mobility is viewed as a key force that will change the environment in the future.

## AFFILIATION DIFFERENCES

A unique perspective can be gained by examining how the background of respondents affects the ranking of importance and attention of individual themes. Survey 2 respondents were tenured professionals affiliated with one of four groups: Academia (49%), Government (17%), Industry (23.4%), or Non-Government Organizations (NGOs, 10.6%). Identifying the themes of major importance (mean score greater than or equal to 4.00) by affiliation revealed similarities and differences, depending on the group. Table 4 lists these themes of major-to-critical importance, as ranked by each affiliate.

Only two themes were rated of major-to-critical importance for all four affiliates: (1) Growing need for global environmental collaboration and (2) Changing business operating and management philosophies. This suggests that the need for collaboration and for changes in business philosophies to promote a sustainable future is recognized as important by all sectors.

In addition, nine themes were rated of major-to-importance by three of the four groups. Several of these themes cover the broad range of transportation and transportation-related issues: Alternative Energy Sources, Urban Planning/Land Use, Increasing Mobility, Alternative Transportation, and Global Warming. Five themes were rated of major-to-importance to one affiliate.

Industrial affiliates rated the theme of growing consumer interest in environmental products and processes very high. This may indicate that business sees an increasing demand for green products in their marketing research. Government affiliates felt that the expanding influence of NGOs and the loss of bio-diversity from diminished natural resources were two very important themes. NGOs, however, did not rate their expanding influence within the cut-off range of major-to-critical importance; presumably, NGOs already believe they play a defining role in environmental issues. On the other hand, they may perceive that their role is not expanding sufficiently to rate a higher level of importance in their own country.

Government respondents also were the only ones to rate New Health Risks and New World View as very important. At least in the United States, it is the government that is responsible for regulating new chemicals and determining health-based standards for those materials. This may explain why the theme of New Health Risks rated high by the government respondents. Oddly enough, only the NGOs saw the changing of fossil fuel prices as one of major importance. Since the popular conception is that increasing fossil fuel prices would lead to a shift away from private transportation toward mass transit, it is surprising that respondents from government did not also rate this theme higher.

Results for the mobility themes are displayed in Fig. 3. In general, respondents from all four affiliations rated these themes as very important to changing the environment in their countries. Yet, there is some diversity in the level of importance of these themes, particularly with respect to vehicular performance as it impacts the environment. It is interesting to note government and NGO affiliates rank this theme lower than those affiliated with academia and industry. We interpret this to mean that survey respondents affiliated with industry feel political and public pressure to improve the environmental performance of their products and processes.

**Table 4. Professional Affiliation Rated Themes of Major-to-Critical Importance <sup>2</sup>**

<b>Forces of Change Themes</b>	<b>Academia</b>	<b>Government</b>	<b>Industry</b>	<b>NGOs</b>
<b>Group A: All Affiliates</b>				
Growing need for global environmental collaboration	X	X	X	X
Changing business operating and management philosophies	X	X	X	X
<b>Group B: Mixture of Affiliates</b>				
Expanding awareness of the changing environment	X	X	X	
Growing belief that an accelerated rate of global warming is occurring	X	X	X	
Change in emphasis on planning for urban and rural land use	X	X	X	
Increasing interest in mobility and the resultant increase in environmental degradation	X	X	X	
Shifts to alternative forms of transportation	X	X	X	
Increasing levels of consumption	X	X	X	
Education's increasing role in the environmental movement	X	X		X
Improving environmental performance of automotive vehicles	X		X	
Technological advances are improving the greenness of products and processes	X		X	
Concern is growing as to the value and viability of alternative sources of energy	X		X	X
Growing concerns for water supply and air quality		X	X	
Growing concern for the loss of bio-diversity		X		
Emerging need for increases and improvements in environmental legislation		X		X
Changes in political interest in environmental issues		X		X
Emerging need for market-based environmental policies		X	X	
Increasing use of environmental business practices		X	X	X
Increasing business collaboration and networking		X	X	
<b>Group C: Only One Affiliate</b>				
Changing fossil fuel prices affect its use				X
Growing consumer interest in environmental products and processes			X	
Expanding influence of NGOs		X		
Increasing varieties of new health risks		X		
Emerging world view of people and their place in the environment		X		

<sup>2</sup> Mean score greater than or equal to 4.0, rating range 1-5.

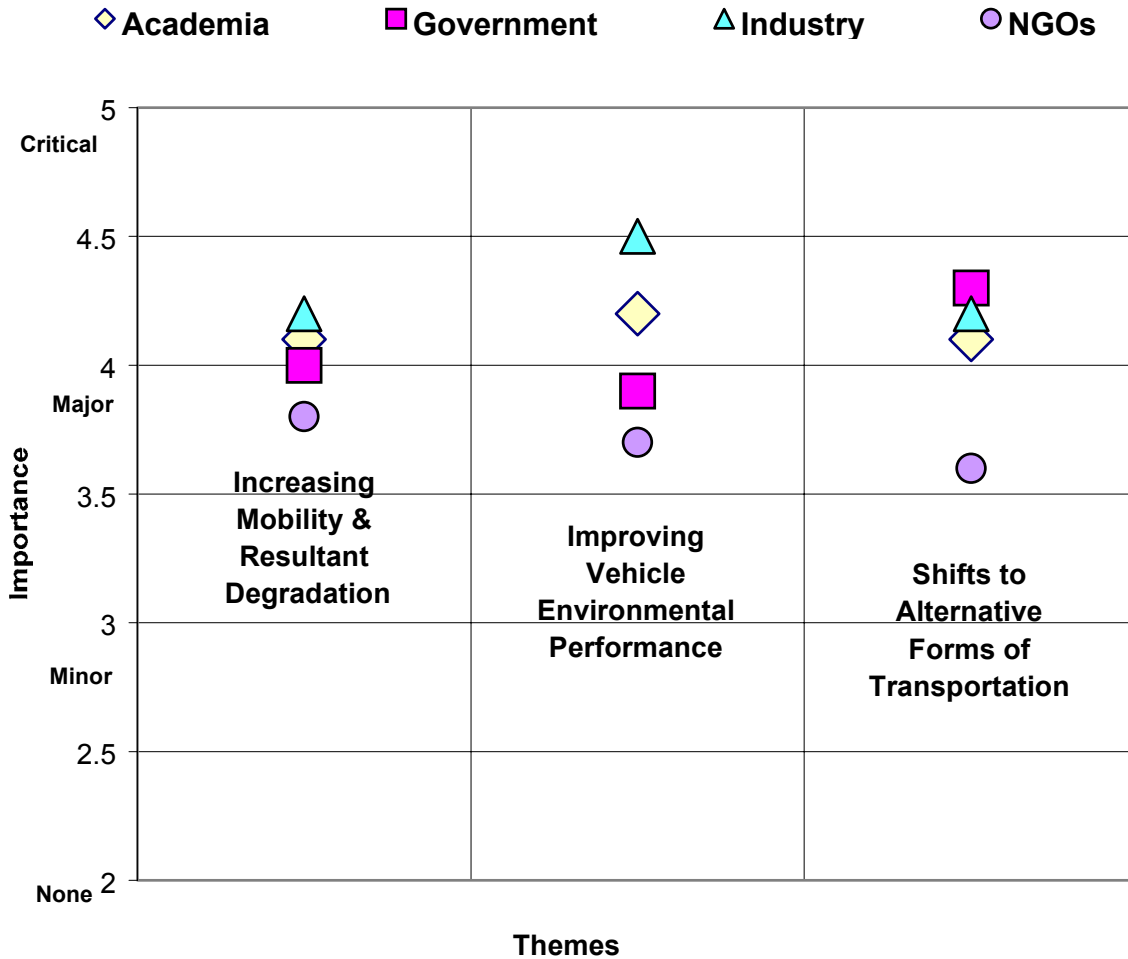


Figure 3. Importance ratings by each affiliation for the three mobility themes. Improving vehicle environmental performance shows the most dispersion of ratings among the affiliates, while increasing mobility and the resultant environmental degradation shows the least. NGOs differ from the other affiliates who rated shifts to alternative forms of transportation of higher importance.

## **DIFFERENCES BETWEEN FULLY AND LESS DEVELOPED COUNTRIES**

The issues identified by this project give us a greater understanding of the differences in environmental issues and perceived solutions in various countries. As mentioned previously, countries were placed into one of two economic groups, Developed or Less Developed, based on the work of Coates, Hines, and Mahaffi (1996). The importance vs. attention matrix for the 36 forces of environmental change themes for both groups were examined and found to be relatively similar. The matrices for each are shown in Figure 4 (developed countries) and Figure 5 (less developed countries).

One difference between the patterns for these two groups is that they vary by the relative amount of attention many of the 36 themes are perceived to be getting in their countries. That is, respondents from less developed countries tended to report less attention for many of the themes envisioning our global environment in the future than those from developed countries. This seems to imply that other matters override the importance of the environment for gaining the attention of less developed countries.

Furthermore, the theme of a growing concern for water supply and air quality stood out from the other themes as the theme of highest-rated importance for less developed countries. In contrast, improving vehicle environmental performance and shifts to alternative forms of transportation as well increasing levels of consumption were the highest importance rated themes from developed countries. Perhaps this reflects a focus of individuals in the less developed countries on environmental themes that are more relevant to their immediate lives; e.g., water and air quality. More abstract themes that have a secondary relationship to the environment (e.g., alternative forms of transportation) become more important in developed countries as economic status and leisure time rise.

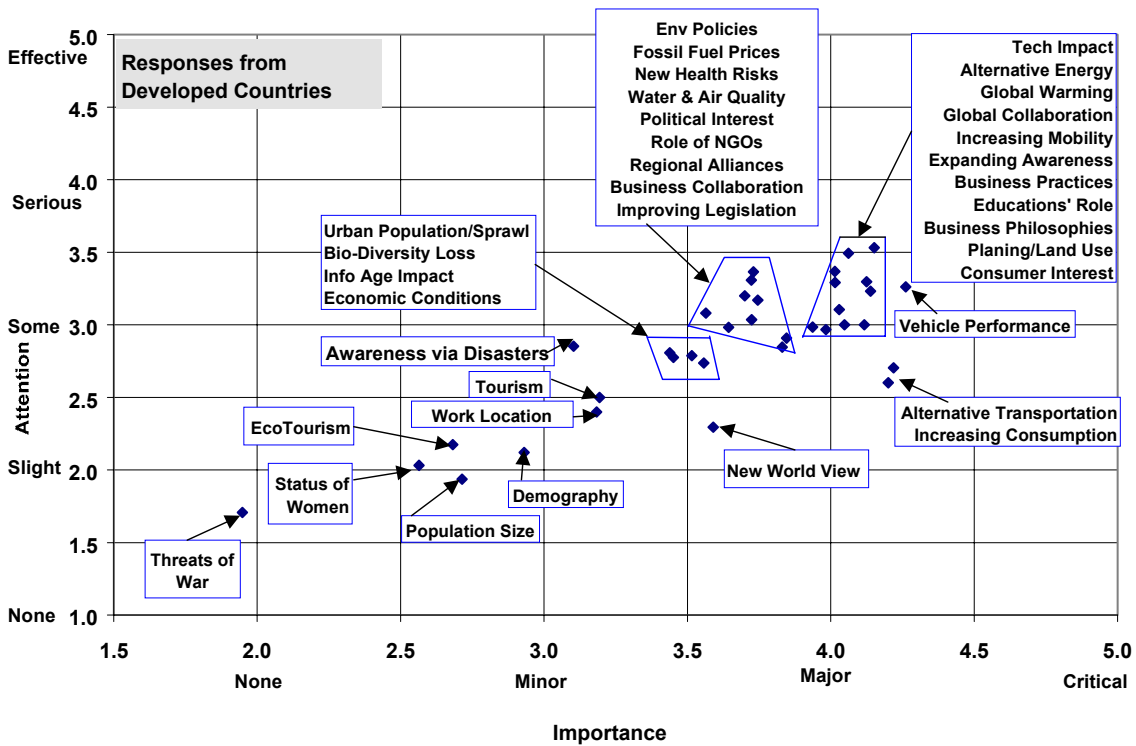


Figure 4. Forces of Environmental Change Theme Importance-Attention Matrix based on responses from developed countries only.

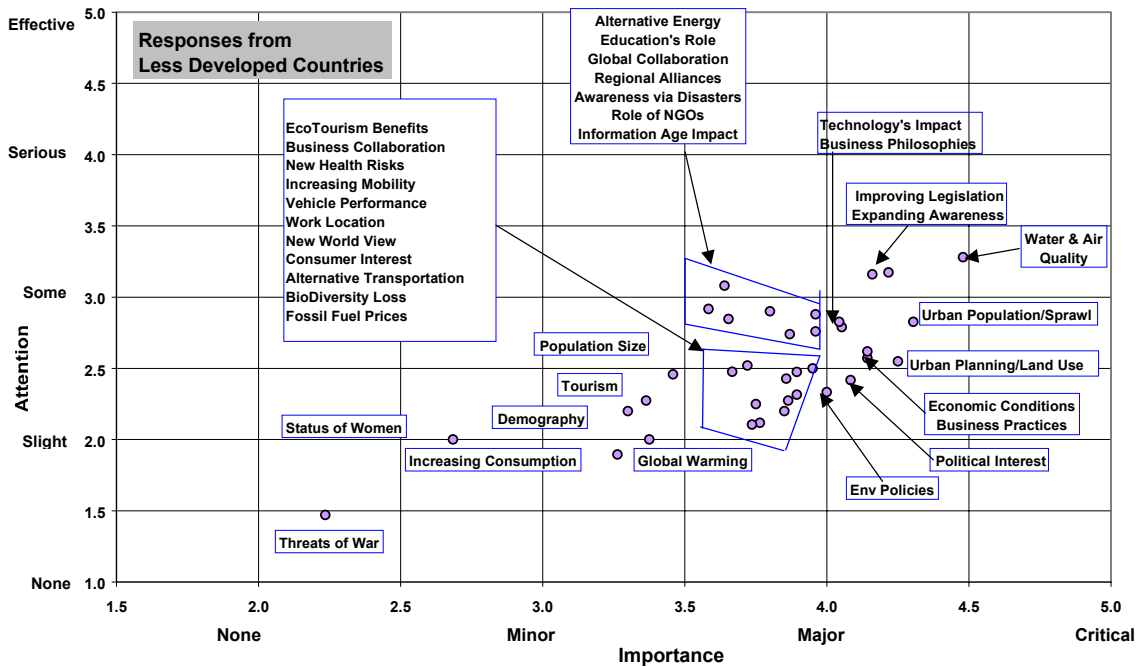


Figure 5. Forces of Change Themes Importance-Attention Matrix based on responses from less developed countries.



**Table 5. Significantly Different Themes for Less and Fully Developed Countries <sup>3</sup>**

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<b>Higher Importance for Less Developed Countries</b>	<b>Higher Importance for Fully Developed Countries</b>
<ul style="list-style-type: none"><li>▪ Concern for Water &amp; Air</li><li>▪ Growing Urban Population/Sprawl</li><li>▪ Need for Improved Environmental Legislation</li><li>▪ Changes in Political Interest in Environmental Issues</li><li>▪ Heightened Awareness Stimulated by Environmental Disasters</li><li>▪ Changing Population Size</li><li>▪ Increasing Benefits of Eco-Tourism</li></ul>	<ul style="list-style-type: none"><li>▪ Shifts to Alternative Transportation</li><li>▪ Increasing Levels of Consumption</li><li>▪ Increasing Rate of Global Warming</li></ul>

---

Other differences were revealed by comparing the average importance of each of the 36 themes for respondents in less developed countries to those from fully developed countries. Mean ratings of importance for these two groups differed significantly for 10 of the 36 themes as shown in Table 5. Respondents from less developed countries rated seven themes significantly higher in importance than those from developed countries did. On the other hand, respondents from developed countries rated three themes significantly higher on importance than those from less developed countries.

The two of these seven themes that differed the most on importance ratings for respondents from less developed countries compared to those from developed countries are: (1) Growing Concerns for Water and Air Quality and (2) Growing Urban Population and Sprawl. As seen in Figure 6, concern for water and air quality as well as growing urban population and sprawl are rated as of major importance to less developed countries while they were seen as of intermediate to almost minor importance to developed countries. We interpret this to mean that less developed countries are recognizing the need address these issues because they will impact the future of their countries, while the developed countries already have been dealing with these issues or have the economic means to expand into rural areas to avoid some of these problems. Furthermore, the areas with the greatest rates of population increases are in the less developed countries such as Latin and South America, Africa, and Asia.

Based on the ratings, the two political themes (political interest in environmental issues and improved environmental legislation) in Figure 6 are seen as of major importance to less developed countries while of relatively minor importance to developed countries. We interpret this to mean that less developed countries are recognizing that political changes are the needed in order to have a sustainable future. Government corruption and/or lack of political interest in the environment are a major concern in less developed countries. On the other hand, this is a relatively minor concern for developed countries. Respondents from less developed countries also recognize that many improvements are needed for environmental legislation and regulation in their countries.

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<sup>3</sup> Based on Coates, Hines, and Mahaffi (1996).

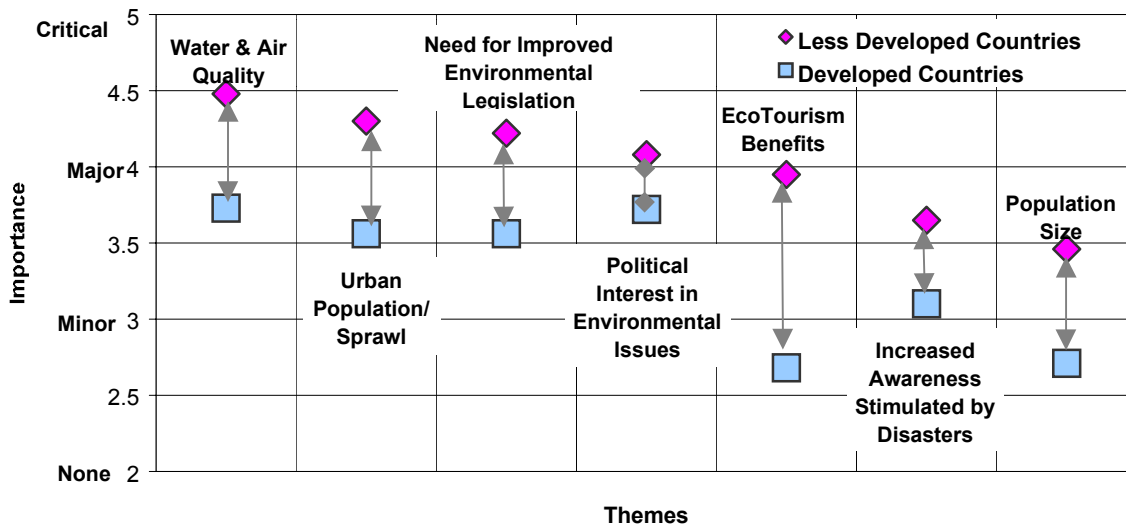


Figure 6. Seven forces of environmental change themes with significantly higher importance ratings for respondents from less developed countries than those from developed countries.

The largest differences between importance ratings by the developed countries compared to the less developed countries are illustrated in Figure 7. Those from developed countries view the belief that an accelerated rate of global warming is occurring as of major importance to their countries while those from less developed countries view this belief as of relatively minor importance. The issue of global warming/climate change is a complicated one. While emissions from the developed world currently make up about 75% of the global emissions of greenhouse gases, the contribution from developing countries is expected to rise to about 50% by 2035, based on economic growth rates around the world. (See Climate Change, 1995) Signatories to the Kyoto Protocol on Greenhouse Gases listed target reductions for only the developed countries and agreed that future protocols would address emissions from developing countries. Thus, this theme has more immediate implications to developed countries. Again, too, the developed countries have more resources and an informed public to address global issues such as climate change.

A balance between the use of public and private transportation is emerging. Those from developed countries recognize that shifts to alternative forms of transportation are more important in their countries than in less developed countries. Globally there is an increase in the development and social acceptance of mass rapid transit. We interpret this to mean that developed countries perceive a need to shift from private to alternative forms transportation to improve the environment.

Finally, respondents from developed countries viewed increasing levels of consumption as more important to their countries than those from less developed countries. We interpret this to mean that in these countries increasing consumption is leading to increased awareness and education with improved science and technology to counter the tendency to overexploit resources and the environment.

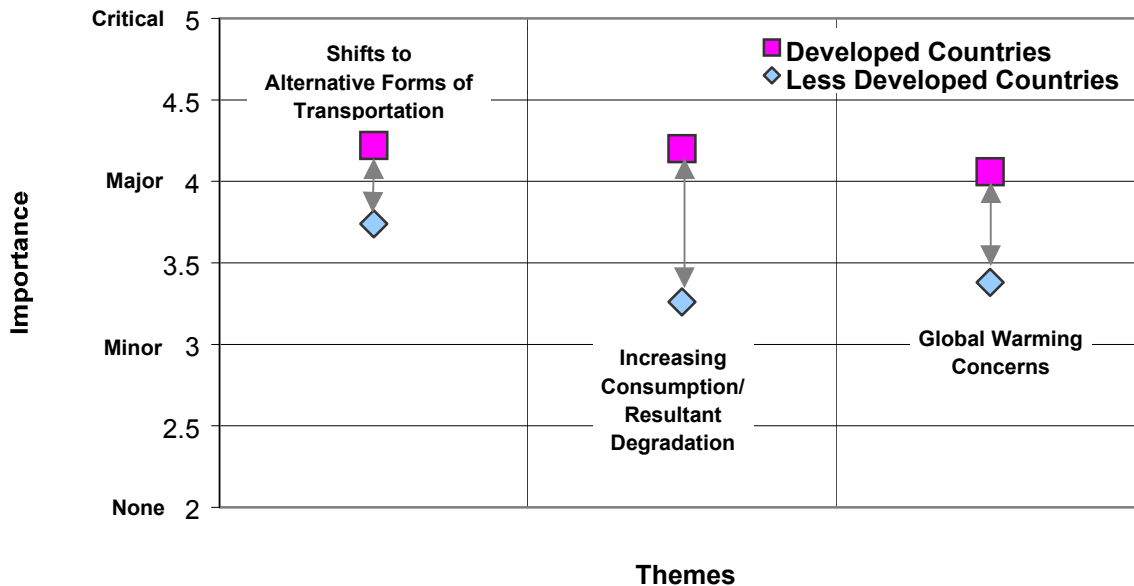


Figure 7. Three forces of change themes with significantly higher importance ratings for respondents from developed countries than for those from less developed countries.

## REGIONAL DIFFERENCES

Regional differences provide additional insights into the reasons for selection of the importance of the 12 most-important themes by the entire group of survey respondents. Respondents from eight regions of the global participated in the GIN Survey 2. However, the number of participants varied by region, with the most respondents being from Western Europe and North America. Therefore, the strength of the differences presented here should be viewed with this caveat in mind. In addition, two regions did not have participation from all countries associated with the region<sup>4</sup>. For the sake of clarity in the following discussion will refer to the region as Middle East and as Eastern Europe. Table 1 provides complete information regarding the countries responding from each region. Several themes of interest are discussed below.

<sup>4</sup> Middle East, North Africa, & India = Middle East; Eastern Europe & Central Asia = Eastern Europe.

## Mobility

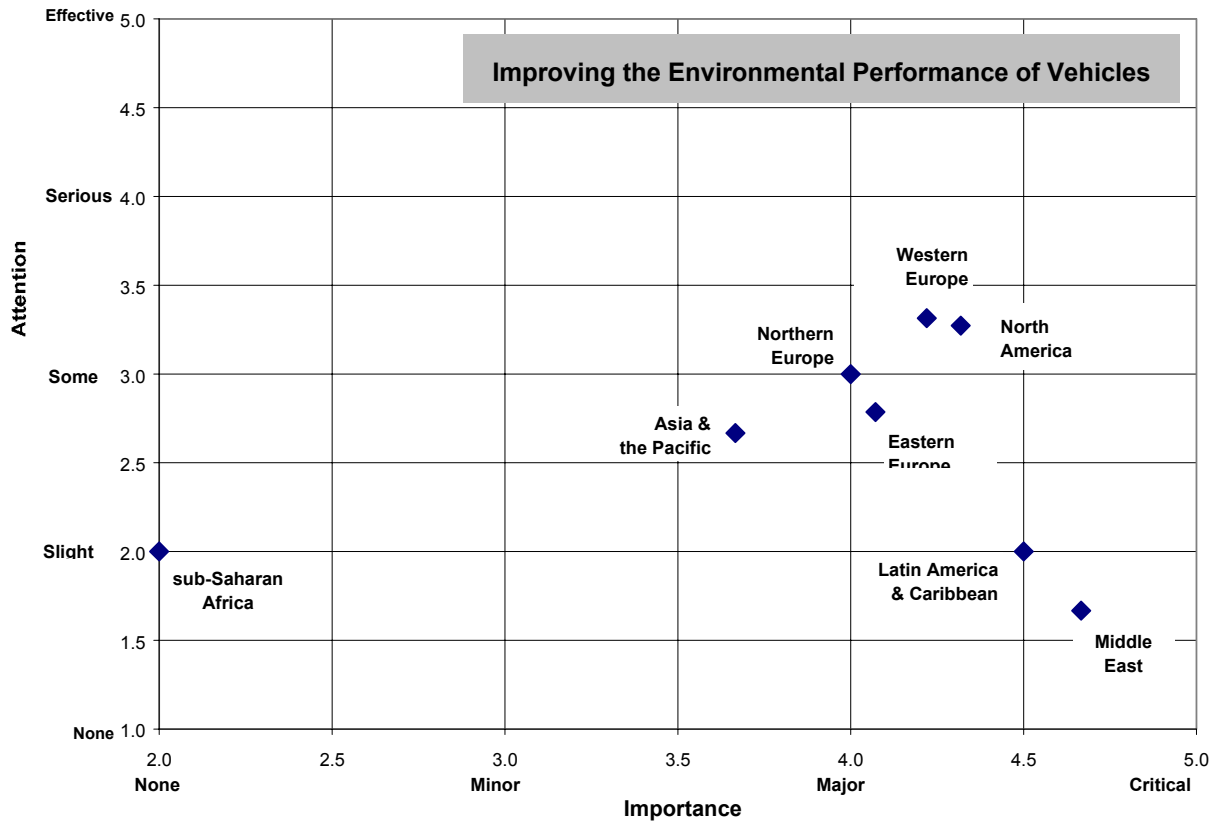


Figure 8. The Forces of Environmental Change Importance-Attention Matrix for eight global regions on improving the environmental performance of vehicles.

### *Improving the Environmental Performance of Vehicles*

Regional differences are seen in the importance/attention ratings given to the theme of improving the environmental performance of vehicles. The majority of responses indicate that improving vehicle performance is expected to improve the environment in their region. Responses from the Middle East region as well as the Latin America & Caribbean region indicated that improving the environmental performance of vehicles is viewed as extremely important but that it only receives slight attention in these two regions.

Responses from European regions and North America suggest that although improving vehicle performance is rated as important, not nearly enough attention is being paid to it in these regions. Similarly, those from Asia & the Pacific indicate that it doesn't receive enough attention but rated it as slightly less important than in these regions.

At the extreme, respondents from sub-Saharan Africa reported that improving vehicle performance was not important in their countries. Perhaps, other forces of environmental change are believed to have more impact on the environment in this region than improving vehicular environmental performance. It should also be recognized that this region has fewer vehicles per capita and a lower income per capita.

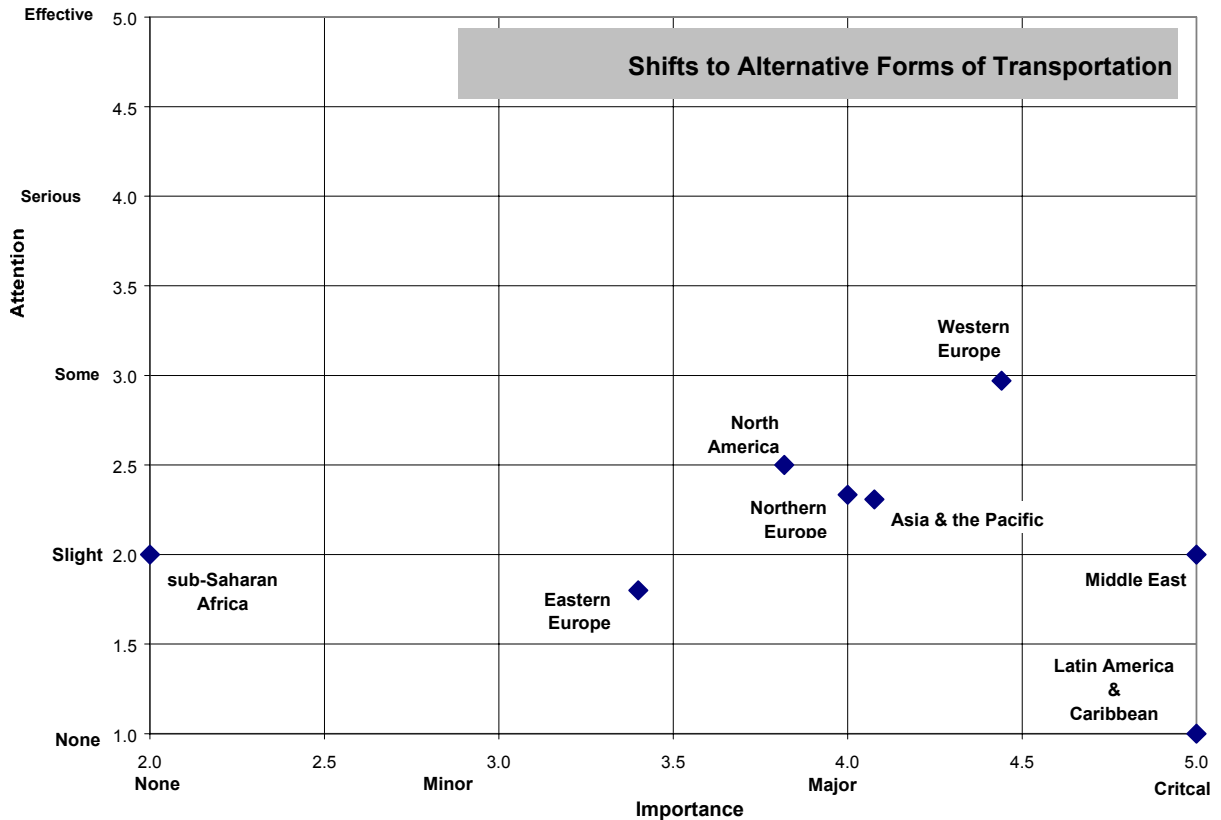


Figure 9. The Forces of Environmental Change Importance-Attention Matrix for eight global regions on shifts to alternative forms of transportation.

### *Shifts to Alternative Forms of Transportation*

Regions also differed on the importance and attention given to shifts to alternative forms of transportation. Responses from the Middle East region and the Latin America & Caribbean region indicate that shifting to alternatives is critically important. However, they also indicate that alternatives are not being addressed in the Latin America & Caribbean region at all and only slightly in Middle Eastern countries. In contrast, sub-Saharan African responses suggest that shifts to alternatives do not pertain to improving the environment in this region.

Respondents from the Western European region reported somewhat more attention and importance for this theme than the other regions. Unlike North America, infrastructure for alternatives to private vehicles, such as railroads and mass transit systems, is better established in Western Europe. Improvements to the established infrastructure and incentives to use alternatives are already actively being pursued.

The Eastern European region rated shifts to alternative forms of transportation as somewhat less important than most other regions; this region also indicated that this theme is receiving only slight attention in their countries. Since private vehicle ownership is more limited in this region, shifts to alternatives appears to be less of an issue than in the other regions.

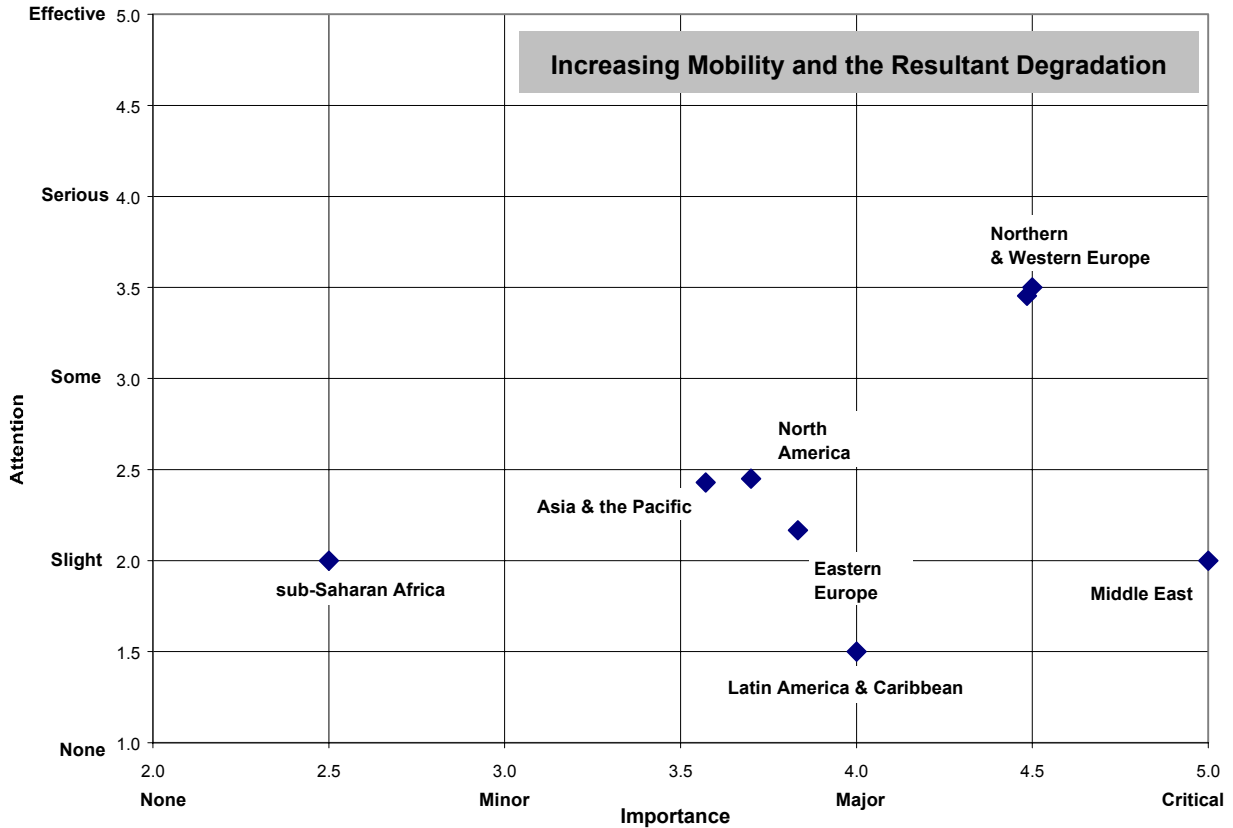


Figure 10. Forces of Environmental Change Importance-Attention Matrix for eight global regions on increasing interest in mobility and the resultant increase in environmental degradation.

#### *Growth in Environmental Degradation from Increasing Mobility*

Several differences were found in the responses from the different regions for the theme of growth in environmental degradation from increasing mobility. Northern & Western European responses indicate that environmental degradation associated with mobility is viewed as very important and that countries in this region have begun to act on this problem.

Although Middle Eastern countries indicate that increasing mobility has critically important impact on their environment, it receives only slight attention. Perhaps the government and other agencies in this region lack the necessary tools and finances to address it. In contrast, responses from the sub-Saharan Africa region indicate that mobility is viewed as having less importance on the future of their region's environment than other forces and, therefore, receives only slight attention. Again, considering the demographics of this region (poor and a struggle just to survive), this is not too surprising.

The responses from the remaining regions (Asia & Pacific, North America, Eastern Europe, and Latin America & Caribbean) are loosely clustered at a moderate level of importance. These regions see increasing mobility as less important than the two European regions and as getting less attention. This suggests that Northern and Western European regions are ahead of the others in addressing potential degradation from increasing mobility.

## Business Cooperation

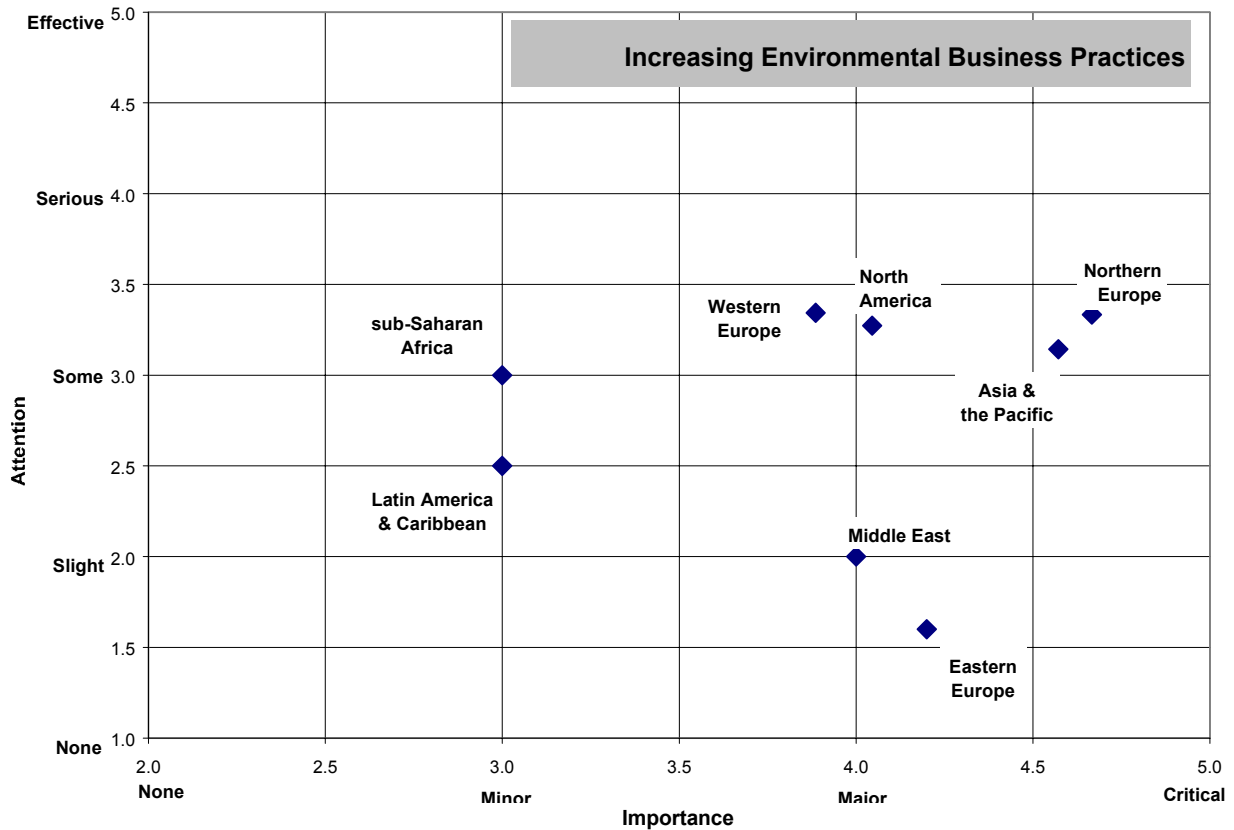


Figure 11. Forces of Environmental Change Importance-Attention Matrix for eight global regions on the increasing use of environmental business practices.

### *Increasing Use of Environmental Business Practices*

Three regional clusters were found for the theme of increasing use of environmental business practices. Responses from Latin America & Caribbean and sub-Saharan Africa regions differed distinctly from the majority. Respondents from those regions indicated that increasing use of environmental business practices is of minor importance to changing the environment in these regions.

Responses from the remaining regions suggested that the increasing use of environmental business practices is very important. The Asia & the Pacific and the Northern European regions in particular stood out. Both regions rated this theme as more important and indicated that more attention was being paid than in the other four regions. Responses from North America and Western Europe are quite similar in the perceived level of attention being paid this theme.

The responses from the Middle East region and the Eastern Europe region indicate that the theme of increasing use of environmental business practices in their countries is of major importance. Even so, they indicate that this theme is receiving only slight attention.

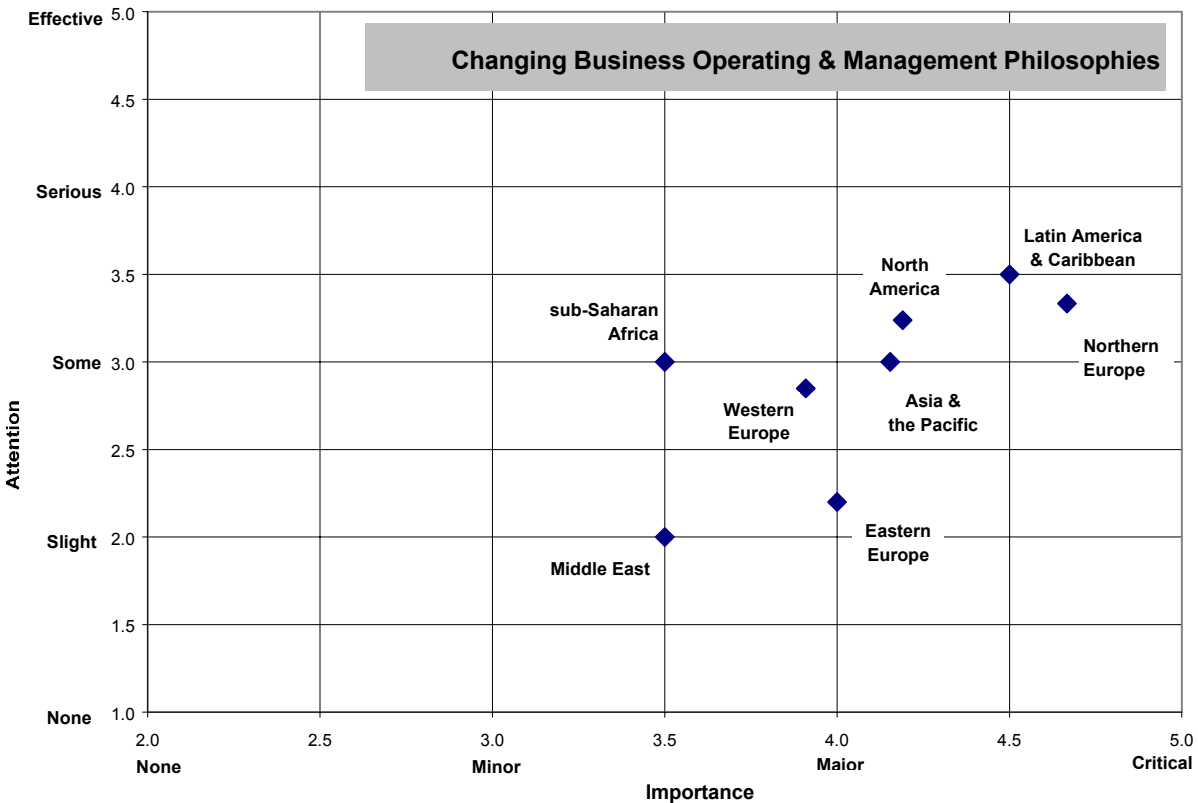


Figure 12. Forces of Environmental Change Importance-Attention Matrix for eight global regions on changing business operating and management philosophies.

### *Changing Business Operating & Management Philosophies*

Responses from the eight regions varied somewhat on the importance and attention that changing business philosophies had on the future of their environment. Those from the Northern European region and the Latin America & Caribbean region stood out by assigning this theme the highest importance rating, while those from the Middle East and sub-Saharan Africa regions rated this theme at a lower, intermediate level. Of these four regions, responses from the Middle East indicate that changing business philosophies receive only slight attention. The higher importance and attention ratings in most of the regions indicate that changing business philosophies are an important step in changing the global environment.

Clustered in the middle of the relative importance rating of this theme were the responses from the remaining four regions: North America, Asia & the Pacific, Western Europe, and Eastern Europe. The responses from Eastern Europe indicated that lower attention was given to this theme compared to the other three regions in this cluster.



## Technology

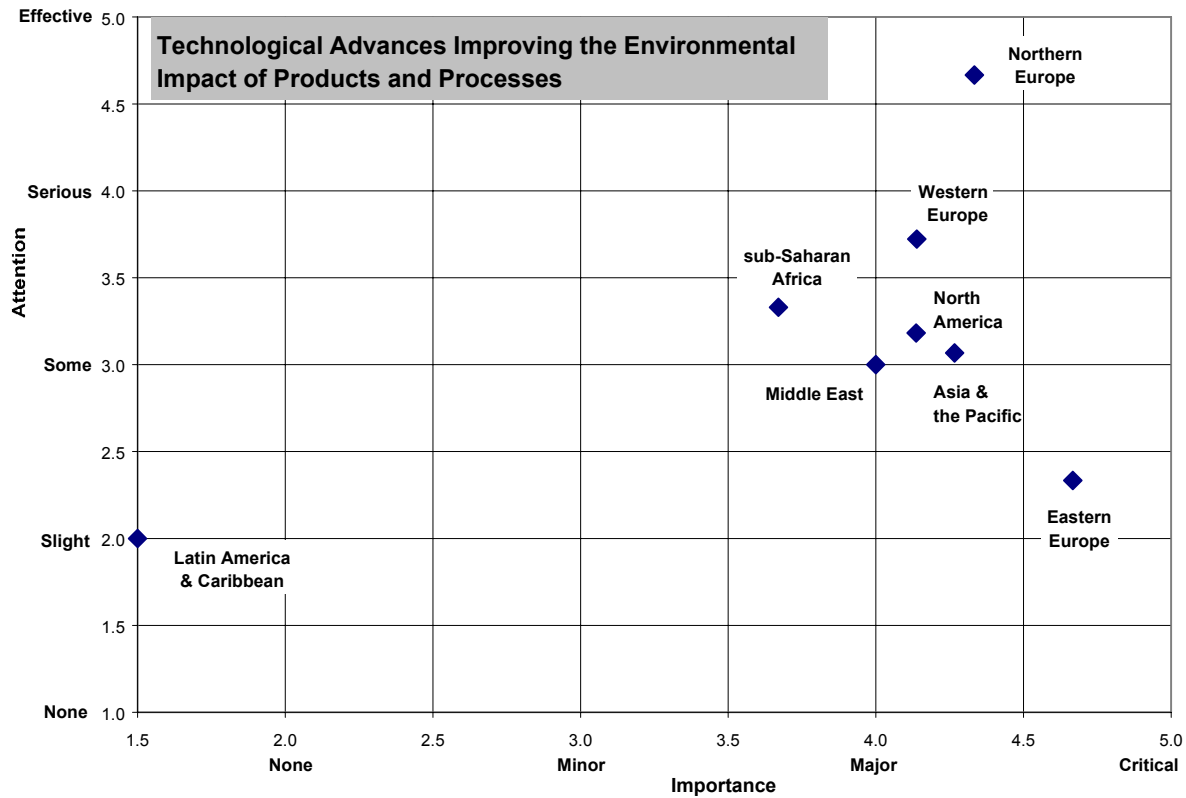


Figure 13. Forces of Environmental Change Importance-Attention Matrix for eight global regions on technological advances improving the environmental impact of products and processes.

### *Technological Advances Improving the Environmental Impact of Products and Processes*

Generally, responses from across the globe indicate that technological advances are of major-to-critical importance to improving the environmental impact of products and processes in their countries. This implies that survey respondents expect these advances to be the key mechanism for improving the global environment in the future.

Even so, responses varied on the attention that technology advances were being paid in their regions. Those from the Northern European region indicated technological advances were being address rather effectively in their region. In contrast, Eastern European region indicates that technological advances get only slight attention. Perhaps this reflects a focus on the dramatic political changes occurring in this region. On the other hand, responses from the remaining regions suggest that some attention is being paid to technological advances but not nearly enough to effectively improve products and processes.

In contrast to the majority of responses, those from the Latin America & Caribbean region indicated that technological advances in products or processes did not pertain to improving the environment in their countries. Detailed comments by the respondents in this region suggested that older equipment and processes are the norm for this region and that technological advances are slow to be adopted, presumably due to lack of capital in the region.

## Education/Awareness

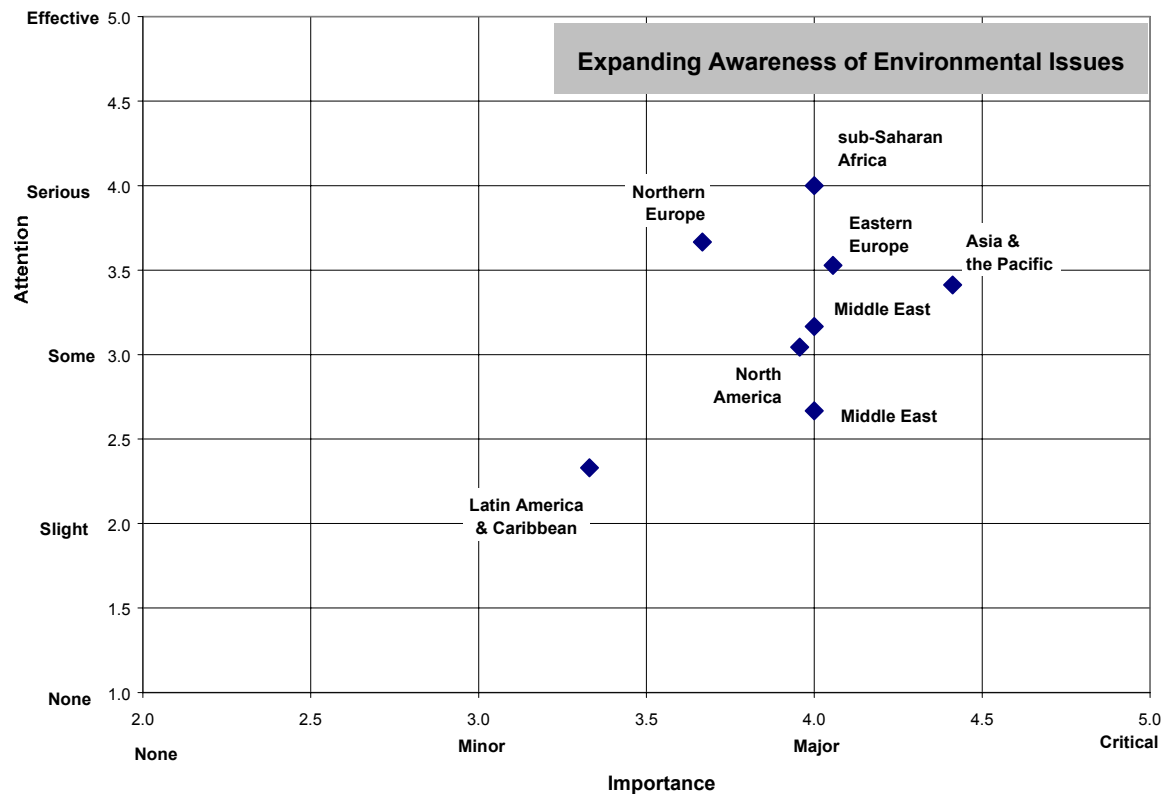


Figure 14. The Forces of Environmental Change Importance-Attention Matrix for eight global regions on the expanding awareness of the changing environment.

### *Expanding Awareness of Environmental Issues*

The importance and attention ratings for the theme of expanding awareness of the changing environment varied across the eight regions of the world. Responses from Latin America & Caribbean showed much lower importance and attention ratings for environmental awareness compared to the other regions.

Responses from the remaining regions loosely clustered at the major importance level and varied slightly on the amount of attention that environmental awareness was being paid. Those from Asia & the Pacific attached somewhat more importance to the theme, while those from Northern Europe suggested it was less important than the other regions in this cluster.

Interestingly, responses from sub-Saharan Africa imply that expanding awareness is receiving serious attention in this. Their responses contrast most with those from the Latin America & Caribbean region. This suggests that the sub-Saharan Africa region has some specific examples of expanding awareness that have been publicized. Contacts in South Africa indicate that one area in which this is happening involves the ever-expanding search area needed to obtain firewood. Likewise deteriorating water supplies and purities in sub-Saharan Africa could play a role in understanding this response.

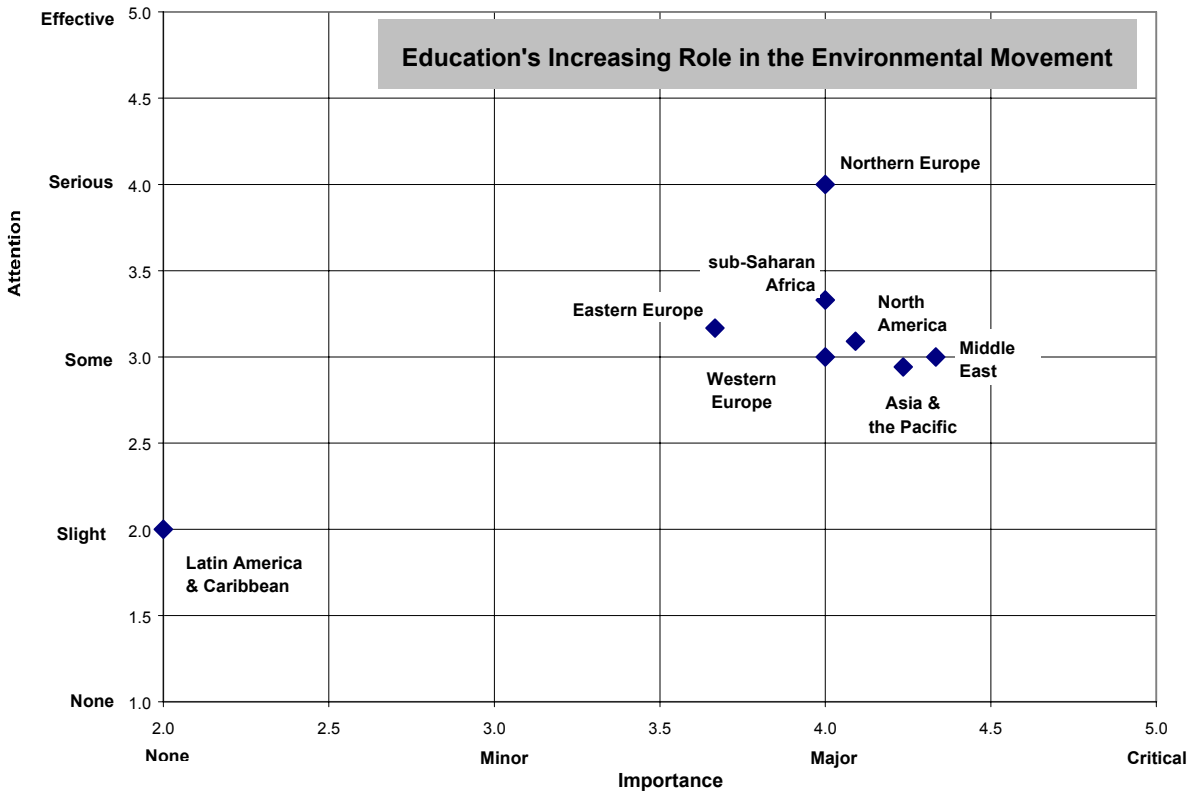


Figure 15. The Forces of Environmental Change Importance-Attention Matrix for eight global regions on education's increasing role in the environmental movement.

### *Education's Increasing Role in the Environmental Movement*

Responses from most of the regions indicate that education has a major role in the environmental movement globally. However, the Latin America & the Caribbean region ranked this theme notably lower in importance and in attention compared to the other regions. Although that region's responses imply that education role's is not important to the environment, their specific comments suggest that an environmental curriculum has not been effectively integrated into their formal educational system.

Northern Europe assigned this theme the highest attention compared to the other regions. Comments from respondents in this region state that environmental education has been integrated at all levels of education.

Respondents suggest that specific objectives and targets for environmental education in the educational system need to be identified and developed. Improving advanced courses are needed to assist industrial and government sectors in the short term. On the other hand, providing better environmental curricula in primary schools will impact the long term. Identifying the educational elements needed for sustaining the environment for future generations still requires more attention.

## Energy

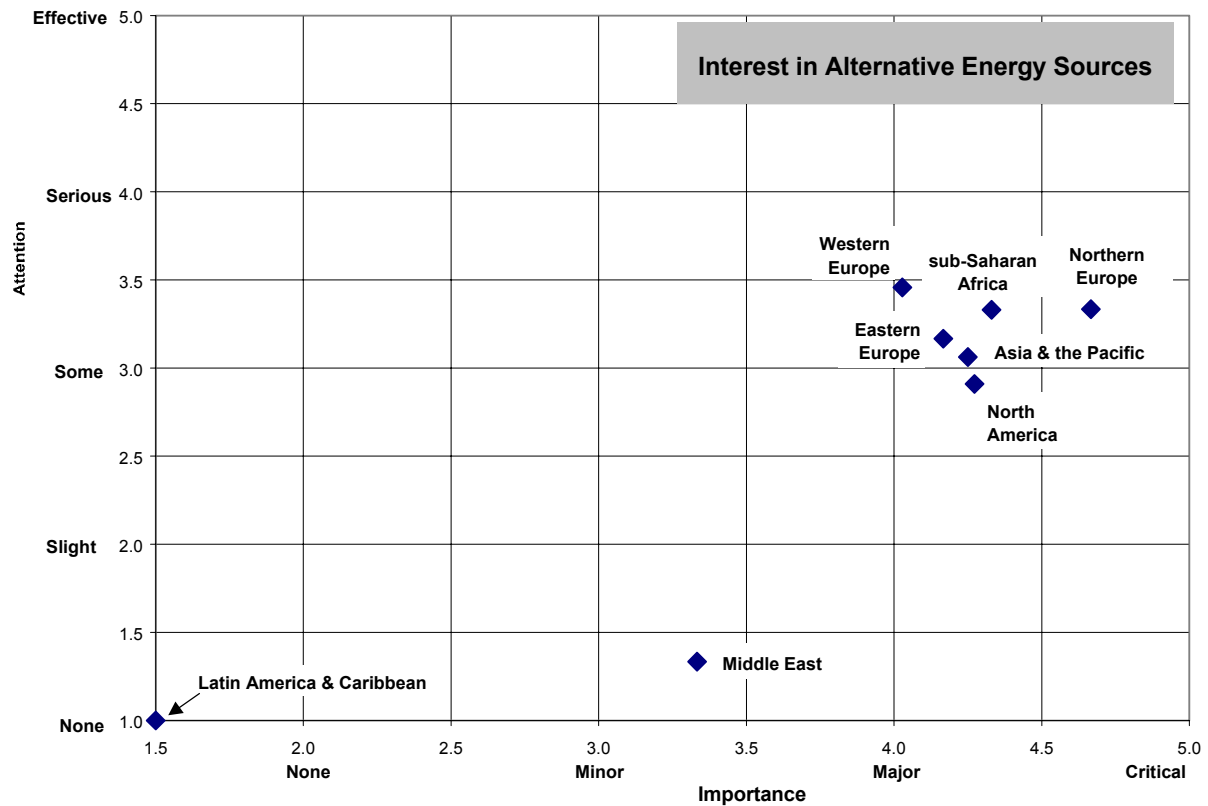


Figure 16. The Forces of Environmental Change Importance-Attention Matrix for eight global regions on interest in alternative energy sources.

### *Interest in the Value and Viability of Alternative Energy Sources*

Most regions responded that interest in alternative energy is of major-to-critical importance in improving the environment, but that not nearly enough attention is being paid to alternatives. Respondents commented that conversion to alternative energy sources would take time because of required infrastructure changes. Any new energy source will also need to meet acceptable availability and cleanliness criteria, as well as be economically feasible.

Two regions had very different views on the importance and attention for interest in alternative forms of energy compared to the other regions: Latin America & Caribbean and the Middle East. Comments from these two regions suggested that as long as coal and oil are readily available, alternatives would not be considered. Government incentives would be needed to convert to alternative forms of energy such as wind power or solar energy.

## Politics

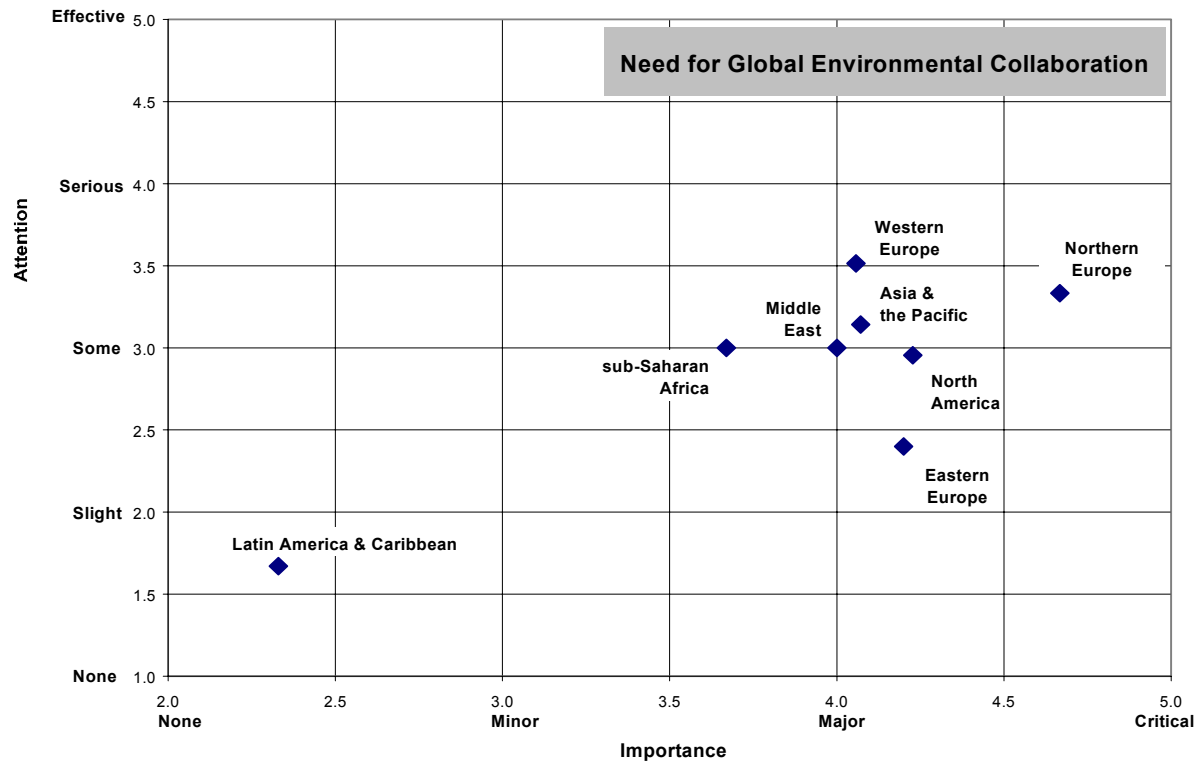


Figure 17. The Forces of Environmental Change Importance-Attention Matrix for eight on the need for global environmental collaboration.

### *Need for Global Environmental Collaboration*

Most regions responded that the need for global environmental collaboration is of major-to-critical importance for sustaining the environment in 2025. North Americans and Western Europeans recognize the potential for global leadership with these collaborations. Regions also agreed that not nearly enough attention is being paid to this theme. Comments imply that it is politically advantageous to form international and regional agreements. A few respondents, however, took the more cynical view that little real environmental action is occurring even with these agreements. This is perhaps an outgrowth of the view by some environmental groups that the climate change issue is not being effectively addressed.

Responses from the Latin America & the Caribbean region fall outside the cluster of responses of the remaining regions. The region ranks this theme very low in importance and in attention being paid to it. However, a careful analysis of their comments reveal that this low rating actually reflects a concern for not being able to meet environmental standards set by others via the collaborative process. For example, products from third world countries could be driven out of the global marketplace through environmental standards that cannot be achieved readily in these countries. Even so, a desire to partner with other regions to finance environmental projects is expressed, but were not so much interested in joint projects to improve environmental performance. This is perhaps a desire to protect local industries and markets from large, multinational corporations and a perceived threat of interference in internal affairs.

## Economics

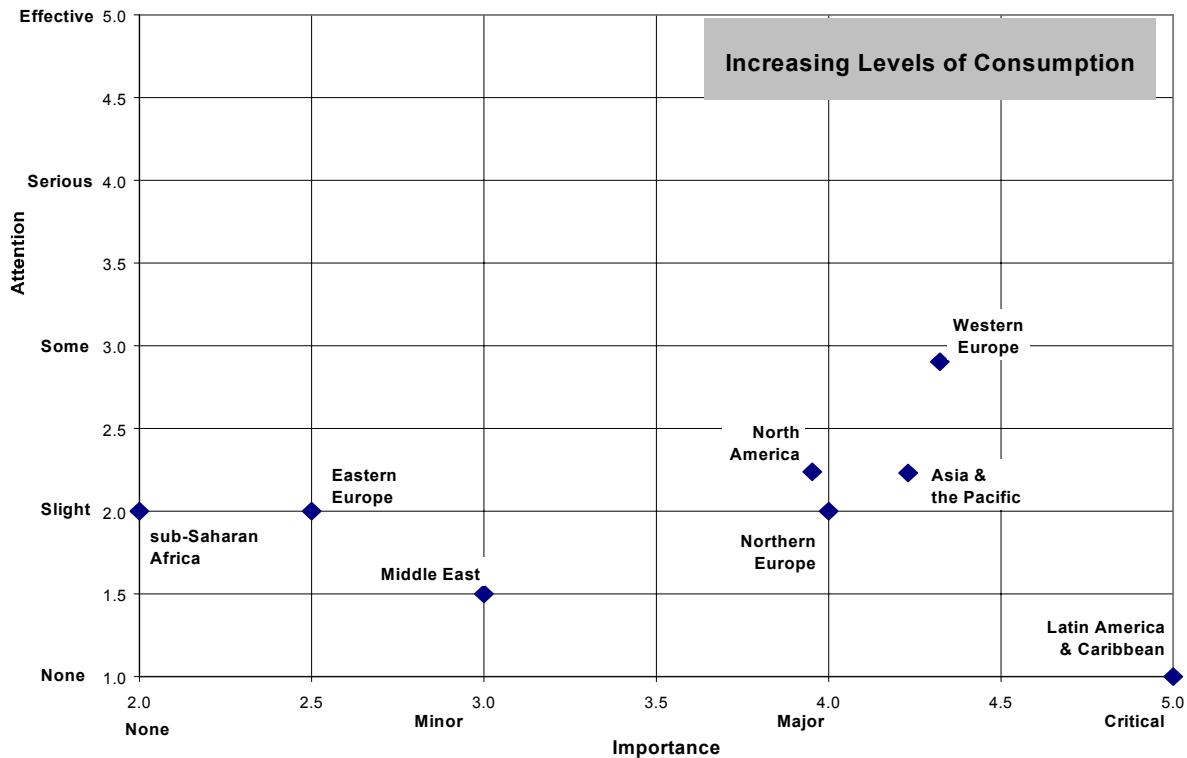


Figure 18. The Forces of Environmental Change Importance-Attention Matrix for eight regions on increasing levels of consumption.

### *Increasing Levels of Consumption*

Responses from the eight global regions cluster into two main groups for the importance and attention given to the theme of increasing levels of consumption. Respondents from the Latin America & Caribbean region, however, did not cluster in either of these two groups. Northern & Western Europe, North America, and Asia & the Pacific form one group that views environmental concerns with increasing consumption as more important than the other group (sub-Saharan Africa, Eastern Europe, and Middle East). Many of the countries in the European, North American, and Asian regions are wealthier and exhibit higher levels of consumption than other regions of the world. For some respondents, consumerism is equated with waste and environmental damage. Others suggest that increasing consumerism will drive the markets to a shift for more ecological products. Some felt that over the longer term (15 yr.), consumption levels may peak and even fall off as the average age of the population of industrialized nations increases. This assumes that a large elderly population would have reduced spending power.

The other group (sub-Saharan Africa, Eastern Europe, and the Middle East) report little importance for the theme of increasing consumption because poverty levels are higher. For the Middle Eastern countries, improving the standard of living is a top priority without any consideration whatsoever for the environmental consequences. Respondents from Latin America & the Caribbean see this theme as a critically important issue even though poverty levels are high.

## Human Settlement

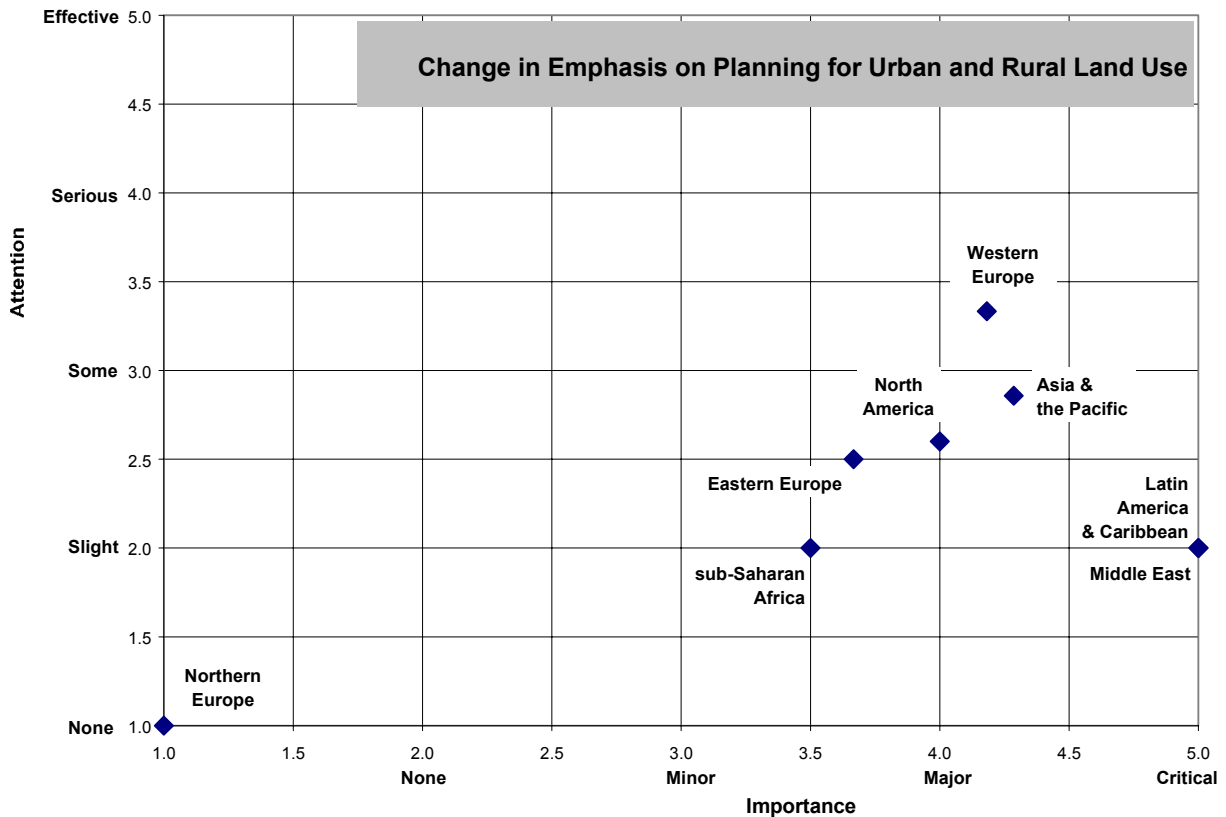


Figure 19. The Forces of Environmental Change Importance-Attention Matrix for eight regions on the change in emphasis on planning for urban and rural land use.

### *Change in Emphasis on Planning for Urban and Rural Land Use*

The eight regions clustered into three areas on the importance-attention matrix for the theme of change in emphasis on planning for urban and rural land use. First, responses from Northern Europe indicate that the change in emphasis on planning for urban and rural land use did not pertain to countries in this region. Respondents offered no comments to explain their view.

Next, the Latin America & the Caribbean and the Middle East regions both reported that land use is of critical importance to the future of the environment in their countries. Typical comments were that poor planning is having a detrimental effect by not slowing urban sprawl and destruction of rural agricultural land. They indicate that there is not a sufficient change in emphasis to sustain the environment. Instead, the regions are changing from agricultural and green areas to urban and asphalted areas that leave room for no natural environment.

The remaining regions view land use as an important theme that is not receiving enough attention. Comments from the sub-Saharan African region indicated that development is continually encroaching on green areas. In contrast, the European region sees progress toward redeveloping existing urban areas.

## **LOW IMPORTANCE THEMES**

The results of rating the attention and importance of the 36 themes identified in Survey 1 showed that five themes were consistently viewed as having minor to no importance. These low importance themes include: Threats of War, Changing Status of Women, Benefits of Eco-Tourism, Population Size, and Demography.

Most respondents acknowledged that war has a direct and devastating impact on the environment. Some mentioned that war is common in the Middle East and that the environment is still recovering from the Gulf War Crisis. Yet, most respondents viewed threats of war as an unlikely occurrence in their country. They suggest that this theme is specifically related to regional issues and underdeveloped countries, where poverty and famine dominate. Even so, concern was voiced that the armament industry still has a major environmental impact without war. One respondent commented that the defense industry continues to waste an enormous proportion of natural and human resources. The theme of threats of war received the lowest importance rating of all 36 themes.

The changing status of women could have a positive impact on the environment, since women are often perceived to be more environmentally concerned than men are (Blocker & Eckberg, 1997). This could become an important driver for increased demand for environmentally conscious products as women advance in society and achieve positions of higher authority. Several respondents commented that women are more environmentally conscious but the long term positive effects of their higher status aren't seen very clearly. Some ventured that the rising status of women might actually have a negative impact on the environment. They explain this negative impact through an increase in transportation demands as more women enter the workplace, an increase in single households with higher energy consumption as women wait longer to marry, and higher conspicuous consumption. Therefore, it is viewed with less importance than other themes.

Population size and demographics both address issues of human settlement and its impact on the environment. Most respondents recognized that increasing population is associated with greater environmental problems. Some pointed out that this is why family planning has been promoted. Many respondents felt that population growth is not an issue in their countries. On the other hand, aging, immigration, and urbanization were the demographics most often mentioned. These trends would have a mixed impact on the environment. The implications of an older population for the environment were not clear.

Many respondents believed that eco-tourism is ill defined. This is because it has the potential to be good or bad for the environment. It will be good if it leads to habitat preservation, but bad if it leads to an invasive growth of uncontrolled tourism in pristine areas. Others suggested that eco-tourism will grow rapidly; however, they think that very few people know what it is.



## SUGGESTED GREENING OF INDUSTRY NETWORK INITIATIVES

### Initiatives Overview

The last part of Survey 2 asked recipients to suggest initiatives that the Greening of Industry Network, in partnership and cooperation with other groups, might take to address each of the 36 the forces of environmental change themes in the survey. We received 1290 suggestions for GIN and grouped them into similar areas. Listed below are the top initiative areas, including the percentage of initiatives in that area:

**1. *Promote and encourage environmental research (15.4%)***

The number one suggested initiative in one form or another was for GIN to stimulate more research on a wide variety of environmental topics. These ranged from biotechnology to urban sprawl, as well as developing areas such as e-commerce. The general opinion of the survey respondents was that more scientific information was needed to assess the impact of new technologies, products, processes, and alternatives on the environment in different regions of the world. Many respondents also wanted research initiated to address the unique vulnerability of various regions/countries to potential environmental impacts.

**2. *Improve education (10.8%)***

GIN should work with other groups and through proper channels to improve the environmental education curriculum. The general opinion of the survey respondents was that if people were educated properly on environmental issues, their behavior at a personal and company level would improve. Many survey respondents suggested that more Masters of Business Administration (MBA) programs should include environmental modules. Others focussed on the importance of early instruction on environmental issues at the K-12 level. Most respondents felt it was important to integrate environment into the overall curriculum.

**3. *Network on environmental issues (10.2%)***

Even though GIN is a network of academic, industry, and government professionals, many survey respondents suggested that GIN needs to develop a more extensive network. More leaders from industry, government, and NGOs are needed in GIN to affect real global environmental change. Some encouraged networking with additional groups working on environmental concerns (i.e., more NGOs and governmental agencies).

**4. *Improve individual awareness (9.5%)***

GIN should publish persuasive materials and contribute to marketing campaigns to make individual citizens as well as groups aware of environmental issues around them. Survey respondents mentioned such issues as climate change, clean technologies, and loss of biodiversity as important ones on which individuals should be become more aware.

**5. *Enable information access (9.5%)***

The information age and the Internet have made environmental data much easier to obtain. However, the challenge lies in interpreting the data. Respondents suggested GIN, with its expertise in understanding environmental issues, could create environmental web sites that filter, consolidate, and interpret environmental data for the public.

**6. *Host conferences, workshops, and seminars (8.7%)***

Survey respondents suggested that GIN should continue hosting global environmental conferences to disseminate information and stimulate discussions among network participants. Many respondents suggested that GIN could host targeted workshops to address specific environmental issues such as climate change, benefits of eco-tourism, and loss of bio-diversity. Others suggested that GIN should provide training seminars for specific groups such as business.

**7. *Publicize success stories (7.3%)***

GIN should organize or facilitate forums to enable companies to share their best environmental practices, clean technologies, and alternatives. Countries should educate the public and other governments on their environmental experiences and facilitate the use of environmental metrics to measure progress. Some survey respondents also pointed out the role individuals play in improving the environment. The stories of individuals who practice self-sufficiency or take other innovative actions on environmental issues should be publicized by GIN.

**8. *Promote and nurture alternative energy and mobility sources (6.4%)***

Sustainable alternative sources of energy are needed to counter society's reliance on fossil fuel. Many alternative energy sources have been suggested. GIN could promote and sponsor life cycle analyses of these alternatives, which would be useful to help understand which alternatives offer the best environmental choices. Similarly, survey respondents suggested that GIN should encourage alternative sources of transportation such as bicycles and mass transit.

**9. *Provide advice and assistance (4.6%)***

Though not traditionally an area within GIN's auspices, many survey respondents suggested that GIN, with its expertise, should provide advice and assistance to government agencies and industry on important environmental issues. Some of the issues mentioned included a carbon tax on fuels, sustainable communities, new affordable technologies, land use, and others.

## SUMMARY

This project provided insights from global thought leaders on the importance and attention that forces of environmental change evoke for their countries. Twelve of the 36 themes covering a wide range of areas (i.e., mobility, business cooperation, technological advances, education, etc.) were rated as having major-to-critical importance for respondents' countries' environmental future. Even so, respondents conveyed that these themes were not receiving sufficient attention. Among the top 12 forces of change were three themes concerning mobility issues. Improving the environmental performance of vehicles is viewed as critical to solving environmental pollution associated with transportation. Shifts to alternative forms of transportation are of major-to-critical importance but low fossil fuel prices are viewed as depressing interest in shifting to alternatives. Although increasing mobility is recognized to increase environmental degradation, the need to be mobile is perceived to be critical for a sustainable future.

Differences in the importance-attention of the forces of change are found among respondents by the developmental status of their country, their background affiliation, and/or their global region. For example, those from less developed countries rated concerns for water supply and air quality as more important than those from developed countries. Thought leaders affiliated with government or industry rate air and water concerns higher and of major-to-critical importance compared with those from academia or non-government organizations. Yet, industrial thought leaders more than the others view growing consumer interest in environmental products and processes as major-to-critically important force of change. In addition, regional differences varied depending on the theme. For example, most regions agreed that improving vehicle importance was of major importance, but varied more on the importance of shifting to alternative forms of transportation.

Lastly, initiatives provided for the Greening of Industry Network to undertake in response to these themes were grouped into similar areas. Most suggestions were consistent with GIN's mission to stimulate, coordinate, and promote research that conformed to building a sustainable future. Other initiative areas concerned promoting improvements to environmental education at all levels, to growing professional networks, and increasing information access in the future.

The perceptions and opinions from the survey respondents are extremely valuable because they reflect future environmental issues and drivers as seen through the eyes of key thought leaders around the world. The results of these two surveys may not accurately predict global developments and future environment issues in the coming decades, but they do serve to frame the debate and identify major environmental drivers at this point in time. Many of the themes are sufficiently general and intractable at this time that it is difficult to imagine that the importance of the themes would change drastically over the next decade or so. The findings endorse the need to continue with planning for the second decade of the Greening of Industry Network.

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## APPENDIX

### Environmental Forces of Change: Categories and Theme Descriptions

#### Biosphere

##### ***Theme 2: Heightened Awareness Stimulated by Environmental Disasters***

As the quality of life of more and more people is negatively impacted by environmental disasters the greater attention the environment will receive. Although this is not the ideal way to increase awareness it is a powerful stimulus acting as a positive force for the environmental movement. However, terms like “environmental disaster” and “ecological catastrophe” are being overused (presumably by the media) which could lead to dulling the public’s sensitivity to the issue and raising the bar on the severity of the disaster it would take to get the public to respond.

##### ***Theme 9: Growing Concerns for Water Supply and Air Quality***

There are water shortages and the quality of water is deteriorating. Some of the main causes of this issue are increasing population, increasing industrialization, lack of adequate sewage systems and the use of agricultural pesticides and fertilizers. While many view it as a global concern, others view it as being more a concern of particular countries/regions. Some advocated solutions are the use of water pricing/cost valuation mechanisms and development of improved sewage and water recycling systems. Relating to air quality, there is concern about the increase in respiratory diseases.

##### ***Theme 10: Growing Concern for the Loss of Bio-Diversity Stemming from Diminishing Natural Resource Reserves***

Ocean fish reserves are being depleted and rain forests are being destroyed. Arable land is decreasing. Bio-diversity is threatened. Some particular causes for the destruction of rain forests and loss of bio-diversity are clear cutting practices and genetic modifications, respectively.

##### ***Theme 11: Growing Belief that an Accelerated Rate of Global Warming is Occurring***

Major contributors to global warming are the manufacturing industries and transportation. Some of the results of global warming are droughts, floods, haze, forest fires and loss of food production and increased vulnerability of developed coastal areas. One obstacle to the correction of the global warming problem is the lack of consensus on its actual impact to the environment. Another obstacle is society’s reluctance to accept the potential major decline in lifestyle and economy that may result from the forced reduction of greenhouse gases.

##### ***Theme 31: Growing Environmental Degradation Caused by Increasing Flow in Tourism***

Growing tourism is causing more traffic, waste generation, infrastructure development and intense use of resources. Older people who are retiring are adding to the continued increase in tourism.

##### ***Theme 32: Growing Benefits of Eco-tourism***

Eco-tourism is effecting economies in a positive manner, raising environmental awareness and encouraging more investment in preserving the environment.

##### ***Theme 33: Increasing Varieties of New Health Risks***

Chemicals, pesticides and fertilizers are causing increased health problems. There are mixed views about the health implications of genetic engineering. Some are concerned that genetic engineering could cause an increase in health risks, particularly with genetic food modification (i.e. tampering with the natural order of things). Others emphasize the potential of genetic engineering for providing solutions to the world’s increased health problems.

## **Business Cooperation**

### ***Theme 20: Increasing Use of Green Business Practices***

Businesses are changing products to be recyclable and/or more durable. Cultivation practices are emerging. ISO 14000 management systems continue to be implemented. Businesses are starting to adopt voluntary actions to improve the environment. However, closing the loop on resource cycles and reducing environmental impact in every phase of production (not just at the “end-of-pipe”) is still needed. Although increasing numbers of companies understand the need for sustainability there is still concern that the mega-companies will be less than kind to the environment because of their increasing power and financial pressures. In addition, small companies frequently are able to avoid environmental compliance.

### ***Theme 21: Changing Business Operating and Management Philosophies***

Companies are starting to include environmental costs in their bottom line (i.e. the “triple bottom line”). They are broadening their business purposes beyond maximizing financial profit and shareholder value and they are beginning to understand sustainability at the “board room” level.

### ***Theme 22: Increasing Business Collaboration and Networking***

As globalization increases there are more collaborative communication, planning, and management activities occurring in multinational companies. It is believed that the environmental movement will benefit from it by the increased likelihood that global environmental standards would be developed and technology and expertise would be shared

## **Economics**

### ***Theme 17: Changes in Economic Conditions***

One view is that economic *downturns* negatively impact the environment by diverting attention away from the environment. Another view is that economic *growth* negatively impacts the environment by stimulating increased consumption. Economic growth can have a neutral or even a positive impact on the environment if economic growth comes from service and information industries and less on manufacturing.

### ***Theme 29: Increasing Levels of Consumption***

For the most part, it is believed that economic growth and higher standards of living lead to increased consumption. Areas of particular concern are 1) in the United States, where consumption is higher per capita than in any other nation; and 2) in developing countries where economies are growing with an increasing desire for higher standards of living. A potential counter active force is that the economic growth of these countries is likely to lead to increased education and environmental awareness, and improved science and technology. Two counter active trends are the shifting of consumption from products to information and services, and the increasing importance society is placing on “quality of life”. A different view expressed is that a decline in the standard of living causes countries to “push harder” on the environment and overexploit resources even more. Still yet another view is that an economic crisis could lead to a “buy less, waste less” culture.

### ***Theme 30: Growing Consumer Interest in Greener Products and Processes***

An increasing number of consumers are choosing products that greener and/or produced by companies that are known to be friendly to the environment. The emerging shift in consumer demand is providing continued encouragement for companies to keep providing these products and to use greener processes to produce them.

### ***Theme 34: The Impact of the Rising Status of Women on the Environment***

Most views reflect that the environmental impact will be positive because women, on average, are believed to be more environmentally conscious than men. Also, as the status of women rises, the resulting increase in women’s education levels will lead to a decline in birth rates and to a positive influence on the environmental education of children. A different view from a

minority of responses was that the rising status of women could negatively impact the environment because consumption and birth rates may increase as a result and it might even correspond to *higher* birth rates.

### Education / Awareness

#### **Theme 1: Expanding Awareness of the Changing Environment**

Increasing awareness is a *main* driving force in the environmental movement. Greater awareness increases the potential for environmentally and socially conscientious leadership, strong environmental regulations and enforcement, greater business initiative towards environmental sustainability and changed societal values that lead to a “quality of life” emphasis.

#### **Theme 3: Education’s Increasing Role in the Environmental Movement**

In many countries there is a need for an environmental curriculum in their education system. However, some countries have a more basic need for a quality, general education. Environmental education has become more mainstream than it used to be. However, there is still room for improvement. Some suggest that it should become a compulsory element in educational standards. Audiences that should be targeted for environmental education are K-12, universities (in general) and Master of Business Administration (MBA) programs. The objective of an environmental education is that ultimately it would lead to change behavior through environmentally informed decisions on both the consumer and corporate level.

#### **Theme 36: Emerging World View of People and Their Place in the Environment**

There is hope for harmony between humans and the environment if society embraces a more systemic world view where people truly understand their place and impact in the world eco-system. There is a potential for a complete paradigm shift that goes beyond the “pollution as a threat” mind set to “sustainability as a challenge”.

### Energy

#### **Theme 7: Concern is Growing as to the Value and Viability of Alternative Sources of Energy**

There has been slow progress in developing alternative energy sources as fossil fuel is being depleted. The increasing damage fossil fuel is causing to the environment is as great of a concern as the fact that the supply is dwindling. Other concerns are about which renewable energy sources might be used in place of fossil fuel. The increased use of nuclear energy is of particular concern because many do not believe it can be made safe. Other hopeful alternatives include energy from the sun and wind although the technology is relatively undeveloped. Key characteristics of new energy sources are cleanliness and renew-ability.

#### **Theme 8: Changing Fossil Fuel Prices Affect Its Use**

Changes in fossil fuel prices greatly influence how much fossil fuel is used and how much investment and research is devoted to finding alternative energy sources. As prices go down *more* fossil fuel is used and less attention is devoted to finding alternatives.

### Human Settlement

#### **Theme 18: Changing Population Size**

Many believe population growth is the root of all environmental problems. Some views reflect less concern about the local impact and more concern about the global impact (responses from developed countries). Much of the concern is directed at population growth in some of the developing countries. Some views focused on population growth due to migration and the associated problems. Although some governments are making a significant effort to decrease population growth through birth control and family planning, they lack the means for effective implementation. Birth control and family planning are not enough; people need an assurance of stability. Not everyone is convinced that population growth is a problem. In fact, a population decline could have a negative impact on the labor base that in turn could worsen economies and



ultimately have a negative impact on the environment.

***Theme 19: Changing Population Demography***

The emergence, change in size and geographic distribution of various demographic segments impacts the environment in a variety of ways. For example a rise in the number of single households increases consumption and an increase in the number of retired people decreases tax revenues available for the investment in environment. The culture and value systems of future of decision-makers could have the largest impact on the environment.

***Theme 23: Growing Urban Population and Urban Sprawl***

Continued urban growth increases environmental stress in concentrated land areas with increased pollution, congestion, consumption and high-risk housing. General environmental degradation spreads as urban sprawl develops and is compounded by inadequate planning for infrastructure and the increase in traffic flow. However, increased urbanization is likely to increase efficiency, greater awareness of environmental concerns and public pressure for remedial measures.

***Theme 24: Changes in Where Work is Located***

For some areas of the world information technology has enabled work to become more decentralized. People are able to work at home or from remote sites. In other less developed areas, people are migrating to the cities to find work because it is becoming increasingly difficult to earn a living in the rural countryside. The negative impacts to the environment resulting from migration to the cities are similar to those for "Growing Urban Population".

***Theme 25: Change in Emphasis on Planning for Urban and Rural Land Use***

Inadequate urban designs and the general lack of land use planning has resulted in congestion, loss of green areas, loss of photosynthesis and increased air pollution as more and more land goes from rural to urban use. However, some countries are experiencing a trend toward urban regeneration which is encouraging cleaner, quieter (e.g. via restricted vehicle access) cities and the regeneration of parks and wildlife areas. Wetland reclamation, a form of land use planning, may have a negative impact on tourism and industry.

**Mobility**

***Theme 26: Increasing Interest in Mobility and the Resultant Increase in Environmental Degradation***

Increased global trade and tourism have stimulated an increased need for both ground and air transportation. There are increasing numbers of vehicles and fossil fuel use is on the rise resulting in some increases in air pollution and carbon dioxide. Some are concerned about the destruction of natural landscapes. In addition, there is a trend in the US toward larger vehicles that consume fossil fuels at higher rates.

***Theme 27: Improving Environmental Performance of Automotive Vehicles***

Various technologies are being developed to lessen the environmental impact of the transportation industry. The different technologies noted are solar, electric, and hybrid. Also under development are fuel-related and automotive engine technologies. Moving away from fossil fuel use and developing on-board energy storage is critical to solving environmental pollution from the transportation industry.

***Theme 28: Shifts to Alternative Forms of Transportation***

There has been a reduction of private vehicle use due to the development of and increase in social acceptance of mass rapid transit. In addition, bicycles are increasingly perceived as a viable form of transportation for work and other non-work trips. In general, a balance between the use of public and private transportation is emerging. Some felt there is still a need for dramatic and coordinated transport policies to reduce the use of private cars and commercial trucks.

## Non Government Organizations

### ***Theme 4: Expanding Influence of Non Government Organizations (NGOs)***

Some NGOs serve as an environmental check and monitoring system for world activities. There are differing opinions about the level of impact NGOs are currently having on the environmental movement. Some indicate that NGOs' influence on environmental issues is well established, while others believe their power and influence is marginal, partly due to lack of social acceptance. Many expect that their social acceptance and influence will increase in the future. However, there is some caution that NGOs' interests are not always the same as those of the public.

## Politics

### ***Theme 12: Growing Need for Global Environmental Collaboration***

The increase in global trade, trans-boundary environmental issues (including threat of nuclear war) and the political instability of nations emphasizes the need for continued global collaboration on environmental issues. Many countries will benefit from the resulting shared environmental standards and technologies. Major obstacles to global collaboration are international conflicts such as those resulting from increasing economic polarization of countries and perceived threats to national security. An opposite view is that global collaboration could lead to a loss of local identity and national diversity if economic globalization moves towards "control through uniformity".

### ***Theme 13: The Impact Regional Alliances Have on Environmental Legislation***

Legislation and regulations resulting from regional alliances are stronger with more widespread effect than those of individual nations. The forming of the European Union (EU), in particular, has resulted in stronger regulations having a positive environmental impact. Another view is that regional alliances are negative because they limit national discretion on dealing with environmental issues.

### ***Theme 14: Emerging Need for Increases and Improvements in Environmental Legislation***

Many improvements are needed for environmental legislation and regulation. More legislation and regulation is needed. Enforcement is needed as well as higher punitive consequences for failure to comply. Improvement on policies relating to particular environmental issues is needed such as protection against natural disasters and those relating to industry.

### ***Theme 15: Changes in Political Interest in Environmental Issues***

Government corruption and/or lack of political interest in the environment is a concern for some countries. Others are seeing an emergence of public involvement in the environment as more information is made available and as their government becomes more decentralized. Public involvement is viewed as a positive force on the environment. There is greater social acceptance of environmental advocacy groups when the level of government involvement is low.

### ***Theme 16: Emerging Need for Market-based Environmental Policies***

Market-based policies will encourage environmentally friendly behavior on both the supply and demand sides. These types of policies include environmental taxes and/or valuation and pricing mechanisms that include the true cost of natural resources.

### ***Theme 35: Threats of War***

It is important to keep peace because war would contaminate the environment with toxic chemicals from weapons and divert human and financial resources away from the social, economic and environmental issues. Regional competition over scarce natural resources or the alliances of some nations (not specified) could increase the possibility of war.

## Technology

### ***Theme 5: The Expanding Information Age is Having a Positive Impact on the Environment***

Information technology, especially the internet, has greatly increased the availability and spread of environmental information. A more environmentally informed public has emerged, increasing the likelihood people will become more active in the environmental movement.

Information technology has also allowed for a decreasing need to travel for purchasing goods and getting to and from work, however, travel for tourism is increasing. Although many countries are benefiting from advances in information technology some countries still have primitive information technologies and infrastructures relative to the world's standards.

***Theme 6: Technology Advances are Improving the Greenness of Products and Processes***

Technology advances are improving the greenness of products and processes by making them cheaper, cleaner and more efficient. Additional areas where technology is being used to improve the environment are in energy, genetic engineering, agriculture and aquaculture.