

R&D – 9266

**Envisioning the Future Global
Environment: GM-GIN Workshop
Summary**

Alexandra Elnick
Chemical and Environmental Sciences Laboratory

Julie A. Blair
GM Corporate Strategy and Knowledge Development

Jerry D. Rogers
Chemical and Environmental Sciences Laboratory



PUBLICATION

GM RESEARCH & DEVELOPMENT CENTER

October 2001
GM NON-CLASSIFIED

Envisioning the Future Global Environment: GM-GIN Workshop Summary

Alexandra Elnick
Chemical And Environmental Sciences Laboratory

Julie A. Blair
GM Corporate Strategy and Knowledge Development

Jerry D. Rogers
Chemical And Environmental Sciences Laboratory

Synopsis or Abbreviated Abstract

In 1998, General Motors began a cooperative Envisioning project with the Greening of Industry Network (GIN) to better understand the possible evolution of global environmental issues in the future. The project consisted of two surveys to identify key environmental change forces and an Envisioning workshop. The four different future global scenarios and the implications and options for GIN to advance a positive global environmental future are presented from the November 2000 workshop.

ABSTRACT

The greening of industry is often perceived as a vital process for achieving sustainable development. One of the challenges facing decision makers today is to anticipate and respond to new pressures in the changing global environment and emerging societal needs. Identifying potential future pressures and possible scenarios can be a valuable way for decision makers to prepare for a sustainable future. For that reason, the Greening of Industry Network and General Motors began a multi-year cooperative Envisioning project in 1998 to develop a shared understanding of the forces of global environment change in the future. The collaborative effort included two global surveys to identify and explore environmental forces of change and an Envisioning workshop.

Envisioning is GM's methodology for helping stakeholders to think out-of-the-box, identify implications, and shape successful future strategies. Academic, business, public interest, labor, and government leaders from The Greening of Industry Network (GIN) met with General Motors (GM) global thought leaders in November 2000 for a two-day "Envisioning the Future Global Environment" workshop to gain fresh perspectives around global environmental issues and help understand future business challenges.

During the two day workshop, leaders discussed the potential implications of consumption, technology, and business policies and philosophies in four different scenarios or future worlds. The basic principles of the scenarios were developed by an internal GM team and used with GM's permission for this collaborative effort. A valuable source of research for the workshop were two surveys on critical global issues and forces of environmental change conducted by GM on behalf of the GIN organization in 1997 and 1998. In addition to gaining insights into how major issues may evolve differently in the future, the overall group developed implications and options for GIN to advance a positive global environmental future.

Table of Contents

ABSTRACT	1
INTRODUCTION	3
Greening of Industry Network	3
GM-GIN Project	3
METHODOLOGY	3
WORKSHOP PARTICIPANTS	6
RESULTS & DISCUSSION	8
SCENARIO DESCRIPTORS	8
SCENARIOS SUMMARY	9
SCENARIO: "MANAGED CHANGE"	10
Environment	10
Consumption	10
Technology	11
Business	12
Society	12
SCENARIO: "GREEN & GREED"	13
Environment	13
Consumption	14
Technology	14
Business	15
Society	16
SCENARIO: "REGULATED LIMITS"	16
Environment	16
Consumption	16
Technology	17
Business	18
Society	18
SCENARIO: "ELECTRONIC GUILD"	19
Environment	19
Consumption	19
Technology	20
Business	21
Society	21
SUMMARY AND CONCLUSIONS	23
ACKNOWLEDGMENTS	25
REFERENCES	25
APPENDIX A	26
AMERICA'S SUSTAINABILITY CRISIS	26
THE CHANGE OF MEANINGS: FROM 2000 TO 2025	27
WHEN OIL AND TOBACCO BECOME ONE	29
APPENDIX B	30
TEAM TASKS	30
APPENDIX C	32
GIN OPTIONS TO ADDRESS FORCES OF ENVIRONMENTAL CHANGE	32
APPENDIX D	36
GIN STRATEGIC PLANNING OPTIONS	36

INTRODUCTION

The greening of industry is often perceived as a vital process for achieving sustainability development. One of the challenges facing society today is to integrate and balance environmental, social, and economic business objectives. Individual companies as well as entire industries (e.g., chemical, petroleum, automotive, etc.) are being judged by their total environmental impact and progress toward sustainable development goals. Identifying future forces of environmental change is a valuable tool to meet these objectives and goals for achieving sustainability in industry. The Greening of Industry Network (GIN) is one group that is working with General Motors to achieve this goal.

Greening of Industry Network

GIN is a research and policy forum dedicated to building a sustainable future. The Network's mission is to stimulate, coordinate, and promote research of high quality, relevance, and usefulness to ensure that the activities of industry 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 insight into upcoming needs for environmental research and public policy directions. General Motors supports involvement with the GIN organization as a way of acquiring insight into future global needs and contributing to a positive future global environment.

GM-GIN Project

In 1998, General Motors (GM) and the Greening of Industry Network (GIN) launched a cooperative project on "Envisioning the Global Environment in 2025." GIN and GM sponsored this project to better understand the possible evolution of environmental issues over the next 30 years and to assist GIN in identifying potential contributions to achieving a positive future global environment. The process consisted of two global surveys (1 and 2) to identify and explore these environmental forces and an Envisioning workshop to develop scenarios, implications, and options.

Survey 1 was used to identify the major environmental themes evolving over the next 30 years, and Survey 2 built on the results of Survey 1 by examining the importance of each theme. The first two phases of the GM-GIN project have generated insights into future environmental drivers and issues as seen by environmentalists, business thought leaders, government officials, and activists throughout the world. The information has been sorted by countries and regions and reveals substantial differences around the world [Elnick, Blair, Rogers & Dunnigan, 2000].

The final phase of this collaborative project consisted of a 2-day "Envisioning the Future Global Environment" workshop held at the GM Research & Development Center in Warren, Michigan on November 13-14, 2000. The valuable global perspectives and ideas gathered in Survey 1 and 2 and previous scenario research done by an internal GM Envisioning team were used as the basis for the issues explored during the 2-day workshop with participants from GIN and GM.

METHODOLOGY

The manager of GM Envisioning and Scenario Planning, Julie Blair, developed the 2-day collaborative workshop. The workshop planning team included Jerry Rogers and Alexandra Elnick from GM Research & Development, Julie Blair from GM Corporate Strategy and Knowledge Development, and Kurt Fischer, Theo de Bruijn, and Ellis Immerzeel from GIN (Figure 1). The workshop agenda or steps consisted of an Envisioning Overview, Thought Provocations, Scenario Introduction, Team Tasks, and Next Steps (Figure 2).



Figure 1. The planning and execution team for the GM-GIN Envisioning the Future Global Environment Workshop. From left to right, front row: Julie Blair, Ellis Immerzeel, and Alexandra Elnick; back row: Kurt Fischer, Theo de Bruijn, and Jerry Rogers.

Envisioning the Future Global Environment

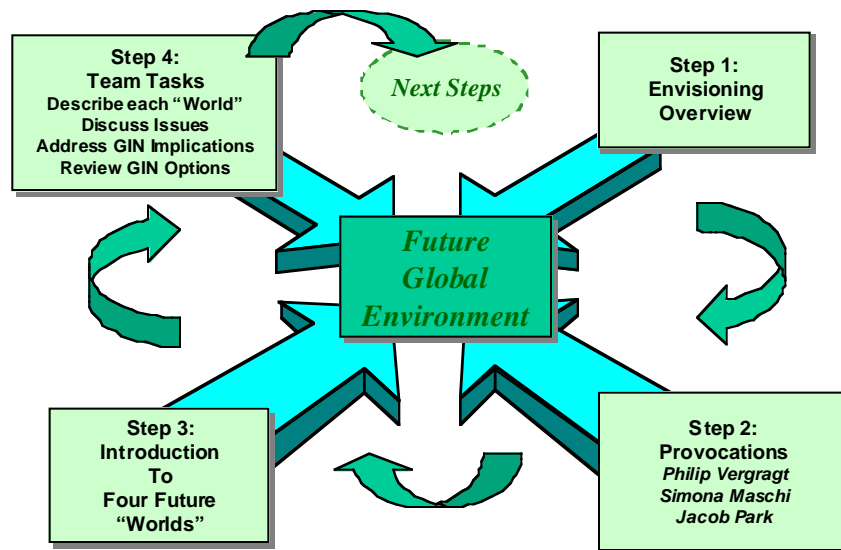


Figure 2. Steps in the General Motors - Greening of Industry Network "Envisioning the Future Global Environment" Workshop.

The overview briefly covered the methodology for scenario development and scenario application to create options for dealing with different future worlds. Scenarios were defined as stories describing plausible and alternative ways the future may occur. Because of the uncertainties in predicting and forecasting trends, scenarios are developed as a way to help improve the robustness of strategies for the future global environment. Then, as part of the scenario process, speakers from GIN were asked to provide three provocations to expand the thinking and focus of attendees and to help them think divergently about this complex topic. The three provocations: "America's Sustainability Crisis" - Philip J. Vergragt; "The Change of Meanings from 2000 to 2025" - Simona Maschi; and "When Oil and Tobacco Become One" - Jacob Park are documented in Appendix A.

Participants were then given a basic framework of four scenarios about the future developed by an internal GM Envisioning team and used with permission of General Motors for this collaborative effort. The scenarios and their uncertain forces of changes were used to explore how issues might play out differently in each of the future worlds.

The major activities of the workshop then consisted of the attendees forming four teams and developing insights into: the status of the biosphere, attitudes of society around consumption, technology, and business policies and philosophies. These issues were selected from the GM-GIN Survey 2. Appendix B contains the instructions and discussion topics for each issue:

- Consumption – the utilization of economic goods to satisfy wants and needs.
- Technological Breakthroughs – technological advances to improve the environmental friendliness of products and processes by making them cheaper, cleaner, and more efficient.
- Changing Business Operating Policies And Management Philosophies – the inclusion of environmental costs in the bottom line, and broadening the business performance metrics from maximized financial profit and shareholder value to include sustainability measures.

A key aspect of the Envisioning process is to have participants from different scenarios or "Worlds" - at selected times during the process - discuss their perspectives on why issues might play out in alternate ways thereby helping the group challenge their normal assumptions and thought patterns. A professional writer captured highlights of these discussions and presentations. Teams also developed a visual representation of their future "Worlds". Finally, the overall group developed implications and options for GIN to advance a positive global environmental future (see Appendices C and D).

WORKSHOP PARTICIPANTS

Thought leaders from the GIN Interim Work Group not associated directly with the auto industry and leaders from several GM internal staffs were recruited to form a cross-functional, global, and creative Envisioning team. Fourteen members from GIN attended along with 11 participants and from GM (Figure 3 and Table 1). Participants were assigned to one of four workshop teams representing each of the future "Worlds". Teams assignments purposefully mixed GM people with GIN members.



Figure 3. Participants and staff attending the GM-GIN Envisioning the Future Global Environment Workshop at GM R&D and Planning during November 14-15, 2000.

Table 1. "Envisioning the Future Global Environment" Teams

Team	Members	Affiliation
Workshop Leader	Julie Blair	GM Envisioning Activity, Corporate Strategy and Knowledge Development (GM)
Managed Change	Ron Williams* Dick Fancy Ward Lamphere Theo de Bruijn Ken Green Monica Winn	Research & Development and Planning (GM) Advanced Portfolio Exploration (GM) Corporate Strategy & Knowledge Development (GM) University of Twente, the Netherlands University of Manchester, UK University of Victoria, Canada
Green and Greed	Cynthia Schleicher* Alejandro Cruz Fred Matekunas Halina Caravello John Dodge Carmen Reveron Philip Vergragt	Corporate Strategy & Knowledge Development (GM) Advanced Portfolio Exploration (GM) Research & Development and Planning (GM) Baker Petrolite Corporation, USA Laurentian University, Canada Environment & Development Consultant, Puerto Rico Delft University of Technology, the Netherlands
Regulated Limits	Alexandra Elnick* Fred Sciance Ellis Immerzeel Jacob Park Eric-Jan Tuininga	Research & Development and Planning (GM) Public Policy Center (GM) University of Twente, the Netherlands Friends, Ivory & Sime, USA Free University, the Netherlands
Electronic Guild	Dexter Snyder* John Chang David Vinson Annica Bragd Kurt Fischer Simona Maschi Bruce Paton	Research & Development and Planning (GM) Public Policy Center (GM) Global Portfolio Development Center (GM) Gothenburg University, Sweden Clark University, USA Polytechnic University of Milan, Italy Rolltronics Corporation, USA

* Team Facilitator

RESULTS & DISCUSSION

SCENARIO DESCRIPTORS

The four scenarios being used in the workshop were introduced with examples of descriptors for each future world. Each GM-GIN team was asked to customize the work developed by the internal GM Envisioning team and come up with their own label that captured the team's collective sense of their scenario "world" (Figure 4). Team A viewed their world as a world of *Managed Change*. The scenario given to them was one in which society's biggest drive was toward equilibrium and traditional organizational structures. In contrast, team B members were given a scenario in which the future world was all about *Green & Greed*. In this world the Internet, consumerism, technology, and education promoted the virtues of speed and change with a diversity of values and desires. Team C called their scenario *Regulated Limits*. The scenario given to this team was a depressed world with little laughter, less hope, and much fear. Lastly, team D labeled their world as *Electronic Guild* [or alternatively as a world of Global Wisdom-Local Action]. Their scenario was a world of trust, where the dual focus is on culture and enlightenment.

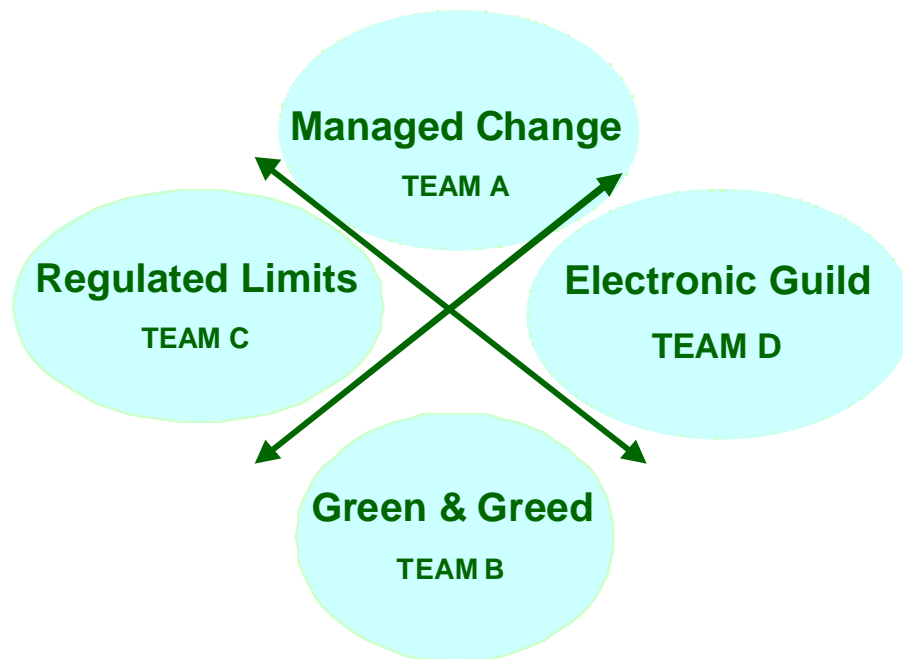


Figure 4. The four Future Global Environment scenarios and four teams.

SCENARIOS SUMMARY

“Managed Change” is a world in which the overriding societal concern is maintaining the status quo. Decisions are reached through the building of consensus. When change becomes necessary; that is, when consensus on how to best address an issue is reached (as in the case of environmental sustainability), society’s collective objective is to create a new status quo as quickly as possible. Stability is seen as the desired end-state; instability is an evil to be avoided at all cost. People are content to let government be the arbiter between large institutions. As a result, this is a relatively serene world with little upheaval or drama and minimal disruption to the usual flow of life.

In “Green & Greed”, free global communication has the most profound influence. It has fostered greater understanding among the peoples of the earth, enabled rapid advances in technology, provided significantly expanded business opportunities, and increased the power of multinational corporations at the expense of national governments. Governments take an active role in promoting economic policies that favor business. Big societal issues are not addressed until they directly affect the individual. In this world, the market is the driving force.

In “Regulated Limits,” Team C members wrote that repairing the earth’s damaged environment takes precedence over all other considerations. In this world, unprecedented power has been conferred upon governmental authorities, giving them control of virtually all aspects of life, including politics, commerce, and lifestyle choices. This is a world where people feel isolated and afraid. There is little hope for a brighter future and general fear that the future will be even bleaker than the present. Pessimism is the prevailing societal attitude. People feel that they have little power to challenge the central authority. Individuals do not strive for a better life; they strive just to survive.

“Electronic Guild” is a connected world. It is a world where societal needs are met through community, both local and electronic. The Internet is a ubiquitous presence, disseminating knowledge around the globe. Information, rather than material goods, is used to actualize ideals and strengthen communities. The “Electronic Guild” functions as a global confederation with common exterior objectives and hierarchy, but operating within different structures. This world respects diversity and readily shares information among different cultures through many networks. “Helenization” has become a social phenomenon by means of which various aspects of culture are exported to others via the Internet – leading to the formation of virtual communities linked by common cultural beliefs. This is a world where local knowledge and values contribute to a connected wisdom.

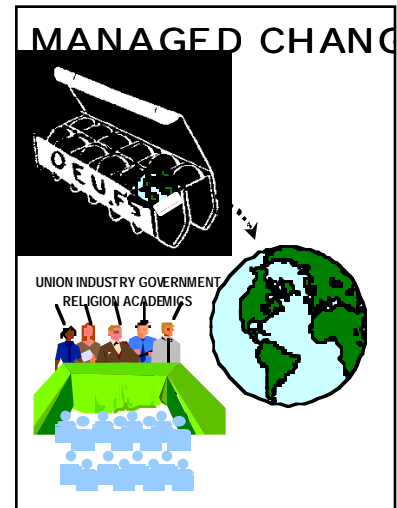
The full details of each scenario developed at the GIN-GM workshop follow.

SCENARIO: “MANAGED CHANGE”

This world is one in which society’s biggest desire is for equilibrium and traditional organizational structures. An example of such a world might be Saudi Arabia, where a strong royal family rules a population almost entirely Muslim or the city-state of Beijing.

Environment

The status of the environment in this scenario is dependent on the views of institutions. When disturbances in the earth’s ecological balance are conclusively documented, the credibility of the scientific evidence is accepted without question because it has been developed with the participation of government, the scientific establishment, industry, and social groups. Society depends on these institutions to identify problem areas and fix them. In this case, those in power are expected to develop the means to husband existing resources, develop renewable resources, and achieve sustainability while continuing to meet society’s needs. Society’s major demand is that solutions be equitable and fair. Therefore, change will initially be slow as the major institutions work to arrive at consensus solutions; but once consensus is achieved, government and industry are able to move fast with almost universal support. Because the large institutions direct change, many of the solutions developed to address sustainability will involve large-scale activities, e.g., centralized recycling, which will facilitate speed and convenience. People quickly adapt to the new processes and societal stability is restored.



This measured approach, however, limits the ability to react quickly in the case of unpredictable, sudden, disruptive events (such as rapid major sea level rise impacting large numbers of people, non-human species, and natural wilderness). Since people do not expect these kinds of changes, they are initially hard to deal with. However, as noted above, actions can follow quickly once a centralized response is developed. Whether these are the best actions depends on the assessment of those institutions in power; to some extent, this limits out-of-the-box thinking, and the consensus solution may not be the optimal one.

Consumption

Because people share common societal values, the consumers market is much less fragmented. Products and services, developed by strong, centralized businesses, are more homogeneous and less individualized. There is also more consensus among consumers about what is important in a product. Functionality supplants status as the most important criterion in purchase decisions. In fact, products that draw attention by their uniqueness or image are a potential source of ridicule and embarrassment for the owner.

Society’s essential fairness translates into at least the perception of a narrowing gap between upper and lower income groups. There is broad agreement on what constitutes a minimal standard of living, and it is generally provided by society through the central government. Taxes are used to equalize income levels. People at the lower income levels thus feel less

disenfranchised by the system. In developing countries, the local government appropriately manages consumption. Those countries with strong, centralized governments have more success at managing consumption than nations with weaker governments.

Technology

Society greatly values technology in this future world, and technology reigns supreme. It is seen as a powerful mechanism for attacking problems. Technologies are big, large-scale endeavors, driven by efficient, large-scale bureaucracies influenced by public policy councils. Decision-making takes into account the needs of all the major groups. Once issues have been debated and a consensus reached, a coordinated plan of action is developed and can be quickly implemented due to the strong centralized governance. This approach allows and requires major investment, which is supplied by both government and business. Because there is broad societal consensus on the technology, incentives are not necessary to jump-start advanced technologies.

A systems approach is taken toward solving technical problems. All the institutions working together can manage the whole value chain. There is little or no squabbling over “turf.” There is substantial alignment of resources and value chains. Individual, isolated research departments no longer exist; rather, research and development is a collaborative effort involving all the major players: government, industry, academia, and non-governmental organizations. This provides huge opportunities for major technological breakthroughs. Because everyone is involved and implementation is centrally organized and managed, it is possible to develop big global solutions to industrial challenges. It is equally possible to implement small, distributed technology on a large scale.

Technology has been used to solve the major environmental challenges, resulting in clean air and water, as well as a reversal of global warming. Affordable desalinization processes have been developed, leading to virtually unlimited water resources from the ocean. There is also abundant energy from renewable sources. The use of toxic materials has been eliminated. Products are designed to be easily recyclable, and they are produced efficiently using environmentally neutral manufacturing processes.

Energy: Driven by environmental requirements, petroleum will be replaced by a variety of new large-scale and small-scale energy sources, including nuclear fusion, wind farms, fuel cells, and solar/photovoltaic hydrogen production. High-tech lifestyles, supported by sophisticated technologies and devices, will be designed to require less energy.

Mobility: Because personal mobility continues to have high value, personal transportation is maintained but takes different forms. Public transportation also is more fully developed, as it too is perceived as providing societal value. There are more integrated transportation solutions (point-to-point service); i.e., travel that combines vehicle / train / air transport to ensure speed, convenience, and energy efficiency. All modes of transportation are highly automated. Vehicles are guided by GPS-based information and control systems; occupants just punch in the coordinates of where they want to go.

Communications: An organized, rational world in which large entities are in agreement has fostered exponential growth in electronic communications. The launch of more satellites and development of improved imaging techniques has led to less need for physical mobility. Telecommunication has reduced the importance of the social dimension of communication; e.g.,

the need to read body language, when necessary, this need is often fulfilled by videoconferencing. The next-generation Internet takes communication capability to a new level with communication implants that allow humans to be directly connected to the virtual world.

Biotechnology: Biotechnology is still viewed with some suspicion, but its adoption continues gradually and is viewed as something that is inevitable. Genetic engineering to produce super humans, while possible, is considered morally wrong; however, enhancements to promote health are seen as acceptable.

Business

In response to societal demands, government requires businesses to institute more robust accounting systems that go beyond strictly financial cost accounting to include social justice issues and environmental impact accounting. This fosters the development of “valuation science”, which goes beyond the traditional economic perspective and assigns values to the ecological, philosophical, and ethical impacts of doing business.

At all times, business operates under a set of agreed upon norms and standards, which are dynamically balanced and can shift as societal values evolve. To oversee this process, businesses have strong boards of directors to provide socially responsible consensus governance. The boards include elites from multiple stakeholders (including environmental groups, clergy, and laypeople). Systems science is applied to improve business management and dispute resolution.

Expanded product stewardship requires that the risks inherent in new product design be borne across the entire value chain, from cradle to grave. Products that have a societal or environmental cost are required to have a full value, or earth, tax. The best products are those that have a cradle-to-grave life cycle.

Society

Stability in the world of managed change is achieved by minimizing inequity among citizens. All parties have a voice in this world: society, governments, businesses, and other institutions (i.e., religious, educational, labor, and cultural organizations). Environmental stewardship activities are supported by all of these groups, and everyone works toward the common good. All institutions and society in general realize and support the idea that reducing consumption is the basis for achieving sustainability.

All age groups are respected in this world. While age and wisdom are respected within organizations, the young are restless. To channel the restlessness of the new generation, schools are designed to be youth think tanks that focus creativity toward positive ends valued by society. However, the educational system does not stimulate individual thinking; rather it reinforces the value of integration with the collective (societal consensus). Mirroring societal values on the virtues of solidarity, families extend beyond traditional structures and organize into communal clusters “Valuation science” is developed to address societal equity issues and is used to address inter-generational equity issues. On a societal level, homogeneity helps to limit discontent.

Representative government truly represents all ages and all groups fairly. Consensus management prevails, but occasional tensions surface that are anticipated and dealt with. On a

global level, there is a broad consensus supporting the Kyoto Protocol and foreign aid, although society is realistic regarding expectations and results. The attention focused on protecting resources needed by humans does not always translate to protection of other species. However, stable biodiversity is valued and society supports efforts to achieve it where the cost is not too high.

SCENARIO: “GREEN & GREED”

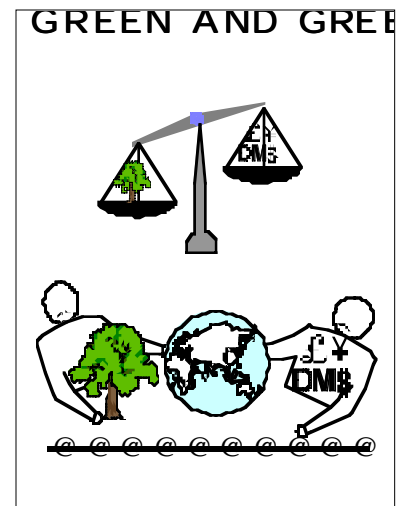
This scenario is one in which the Internet, consumerism, technology, and education promote the virtues of speed and change with a diversity of values and desires. The current evolving European Union, a rather weak federation of individual nations with differing values, might be an example of such a world. The speed and rate of change in this world are characteristic of the city-state of Shanghai.

Environment

The status of the environment in this future world is driven by the impact of individuals. Because of universal access to information, all of the most up-to-date data on global warming is known and the environmental impact of products and manufacturing processes is well understood. Greenhouse gases have increased, but have not become too much of a problem, since improved technology is keeping this issue at bay. Businesses have promoted the establishment of a system for trading off CO₂ emissions, which enables the richer nations to continue to produce and consume the products they desire.

Air and water quality varies greatly around the world. Although the focus of most people is on “me”, the richer, more advanced societies have more resources and promote environmentalism. California is an example of a prosperous “me” society, which has reached an economic prosperity level that enables it to care about the environment and promote pro-environment legislation and policies. Societies in this World routinely tax all resources (such as water, fuel, and even air) that people and industry consume to encourage efficient usage. In many newly developed nations, however, the same focus on “me” has resulted in high levels of pollution. In these countries, economic considerations take precedence over the environment. Coupled with increased privatization of industry, this approach makes environmental problems more difficult to address.

In this World, the population is expanding in many countries, putting great pressure on resources. In the richest countries, population growth has slowed or is trending downward and people continue to have access to natural resources, although they are more expensive. Biodiversity has decreased across the planet, although prosperous businesses and societal entities promote the use of biotechnology to grow new rain forests and preserve animal and plant species. Part of this concern for the environment is driven by the profitability of two competing interests: “eco-tourism,” which allows people to “see the bears” in their natural environment, and the sport hunting lobby, which wants to “shoot the bears”.



@ = symbol for the Internet

If an environmental disaster were to occur in this World, the separate governments around the world would have difficulty dealing with it in a coordinated way, putting great numbers of people in peril. Climate change and the role of greenhouse gas emissions, being a global issue, is an example of this effect. The richer societies with economic prosperity might see this as an issue to be addressed, but getting the rest of the world to help mitigate the problem would be difficult.

Consumption

Conspicuous, virtually unlimited consumption continues as a way of life. The distribution of wealth remains similar to what it was in the past. However, everyone's standard of living has improved – but at the cost of a more diverse values impacting consumption and environment.

People at all layers of society consume more, travel more, and generally eat away at the earth's resources. Even though many of the “haves” are socially responsible, they continue to flaunt high-tech gadgets as a signal of their privileged status in society. With breakthroughs in biotechnology, people live longer, and therefore; consume more in an individual lifetime. In addition, each generation consumes more than the preceding one. In fact, young people take for granted the technology available to them and have difficulty functioning without it.

Even though natural resources are being depleted, this does not hinder the desire of people to consume. Technology is used to develop substitute materials and efficient designs that require less material for production as well as to identify alternative resources. This helps keep prices down even as current resources are exhausted.

Technology

Technology is almost entirely market-driven in this world. However, most technology solutions tend to be short-term, with technologies offering the greatest and quickest paybacks prospering most. For instance, drug development – driven by huge profitability – occurs rapidly. Because of high costs and resource depletion, engines are more efficient, fuel cells come into common use, and energy production in general is more efficient. Rapid growth and profitability has therefore fostered health care improvements and reduced environmental pollution.

On the negative side, large-scale and long time horizon projects that require long-term investment or infrastructures are de-emphasized. An example of this would be a reluctance to move to a hydrogen economy because of the need for investment in a hydrogen infrastructure. At the same time, academia has de-emphasized basic research and moved toward more applied research.

Energy: Local generation of energy is thriving, while energy sources that have large infrastructure requirements have declined. There are niche energy solutions driven by geographic regions.

Mobility: Ownership of vehicles is limited. People pay for transportation services based on their immediate needs. Mass transportation has improved in congested urban areas, particularly in the form of inexpensive environmentally friendly buses. Some cities build new subways, but their widespread construction is limited due to high cost. Less energy consuming, alternative-fueled, smaller, and safer vehicles dominate the non-urban landscape. The developing world has settled into interconnected, small communities that have less expensive transportation networks.

Communications: Everyone has a cell phone, which is much more than a phone. It is a personal assistant / computer / communication device directly connected to the Internet. The Internet has become a commodity (as necessary as electricity was back in 2000). The Internet represents instant connectivity to everyone on the planet and accessibility to all the knowledge of the world.

Biotechnology: The upper tiers of society utilize biotechnology to live longer. Not only has the average lifespan been extended for the rich, but also the potential to live forever exists. It is possible to order organs via the Internet and go to clinics to have them installed. Biotechnology has been harnessed to clean up the environment through biological destruction of pollutants. Biotechnology has also altered the genetic make-up of the food chain, and society awaits knowledge of the long-term effects of this alteration.

Business

Environmental business policies are driven by self-interest. The market is fragmented among those who want environmentally friendly products and those who are conspicuous consumers. Firms that wish to do business with environment-minded consumers have adopted environmentally sound production practices and champion technology advances to combat global warming. Firms that do not see a market for environmentally friendly products feel no need to develop such products.

There is public accountability for companies as well as societal pressure from selected groups to employ sustainable practices. People have amazingly dynamic portfolios. Investors rather than government provide societal vision. Some investors give companies with environmental programs an increased price-to-earnings ratio. Other investors are strictly interested in return on investment. Economics drive the development and deployment of less-expensive clean energy, enabling uninterrupted enjoyment of conspicuous consumption for those to whom this is important. For people in the lower economic tiers, energy costs are subsidized.

Business firms have one of two management philosophies. One style of business focuses on addressing consumers' self-interest. The other type takes a broader view and seeks to capitalize on broader societal interests. In both types of firms, information has high value, whether to understand customer preferences or to gauge public opinion. In fact, most jobs are designed around information. Since information is dynamic and ubiquitous, it requires filtering to glean the most valuable nuggets. The most successful firms are the ones with the greatest capability to apply information in the right context.

Some businesses have been able to enhance the technology transfer process and are able to cope with sustainability issues, even as the lack of regulations limits government's ability to monitor technology. Governments take a *laissez-faire* attitude toward business and there are fewer governmental policies to encourage either old or new business growth.

Companies are primarily small and medium sized because they can manage change and new technological complexity better than big business firms. They are also better positioned to respond to the demands of the diverse marketplace. With the demise of big businesses, entrepreneurship thrives and new ideas abound. However, this also means that there is limited capital available for large projects. Smaller businesses are successful at creating quicker short-term gains in performance, but many small businesses also fail because they lack the resources of larger companies to weather bad choices.

Society

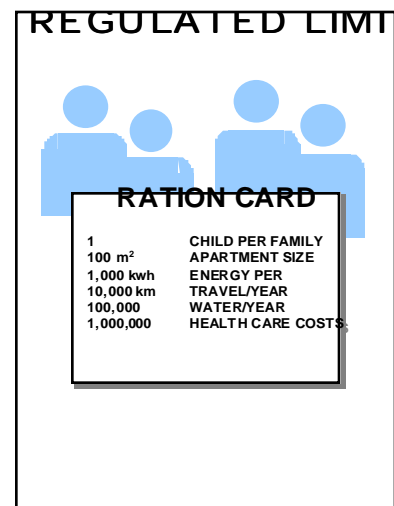
The top tier of society rides the technology wave that continues to develop rapidly, and the lower tier benefits from the trickle-down effect. Greater educational opportunities and universal access to information tend to dissolve cultural differences; human diversity slowly disappears. However, greater use of the Internet has lessened the sense of community that people once felt, leading to a psychologically isolated and insecure population. Public education is under threat as education-for-profit initiatives thrive. Nevertheless, this is a more open society. Since everything is disclosed, people do not generally bother to lie and rogue companies do not actively try deception.

SCENARIO: “REGULATED LIMITS”

In this scenario the world is depressed with little laughter, less hope, and much fear. A historical example of such a world might be populations conquered in World War II. A current example to a different degree might be Malaysia.

Environment

Because this world is characterized by fear at the individual level and governments do not easily accept alternative ideas, environmental issues loom large and threatening. Central authorities dictate the type and direction of new technologies, which generally are focused on abating environmental problems. In the event of major environmental disasters such as nuclear power plant failures, major pollution spills, and significant climate change linked to global warming, governments enact strict environmental regulations. Governments find it necessary to make trade-offs between environmental problems, addressing those that are the most urgent at the expense of others that are less so (e.g., global warming versus water quality). Rationing of energy, natural resources, and allowable emissions is a key policy of the central authorities. Several nations adopt the one-child policy first instituted by China in the late 20th century.



The status of the environment in this World is dependent on the actions of governmental authorities, and people are dissatisfied with environmental policies. Individuals have little impact on these policies. Many people are dissatisfied with the direction and objectives of environmental policies. They feel they are disenfranchised because their values are not reflected in the decision-making process. Access to scarce resources and energy, etc., depends upon who you are and whom you represent. There is tension between environmental and development priorities.

Consumption

As a direct result of the environmental disasters the world has already experienced, strict rationing is instituted. In the “world of regulated limits,” everything is rationed – including food,

water, space, and travel – even needs are regulated!

Government sets production priorities and limits, so consumer choices are constrained. People have to weigh every purchase (and resource usage) because of the trade-offs involved and the need to conserve their ration allotments. Conspicuous consumption is still possible for the wealthy, however, because of a market-based barter system.

Consumption is linked to values, but since there are multiple and diverse values, people do not agree on how available resources and goods should be used. However, all agree that the quality of life has diminished. There is also general societal agreement that wasting resources unnecessarily is morally unacceptable.

The older segments of society are more accepting of rationing. The young feel they have been cheated of their fair share of resources as a result of the irresponsible actions of previous generations. They have a greater tendency to be intolerant and also to blame others for the environmental crises, believing that they had no control over these events. The older generations agree with this viewpoint.

The main aim of rationing is to reduce resource use, but other important objectives are to encourage “environment-friendly” behavior and to motivate innovation, particularly the development of technologies that enable people to do more with less. The young in particular champion technologies that make it possible to consume more with little or no environmental impact. The less idealistic turn to the black market to purchase their “extras” and luxuries.

Technology

Technology is largely the province of government. It is focused on alleviating environmental problems, although the approach is focused on evolutionary technologies that improve efficiency and enhance conservation efforts rather than on achieving dramatic breakthroughs. Technology is directed by the central authorities and managed and coordinated through a government / industry / stakeholder committee structure, which leads to bureaucratic slowness in planning, decision-making, and coordination of research studies. Government labs and/or large research consortia conduct this research. A drawback to this approach is that large consortia are a major obstacle to nimble development and fast implementation of both large- and small-scale technologies. As advances are realized, access to the new technology is rationed by the central government.

Energy: While the central authorities recognize the need for clean, renewable energy sources, changes in this world are evolutionary rather than hyper-innovative. Fuel costs are increasing. The world is moving toward more nuclear-generated electricity, although there is fear of future disasters. Hydrogen is seen as the ultimate energy source, but the move toward hydrogen has only started and the pace is slow. Indeed, given the evolutionary pace of change in this world, it is doubtful that a hydrogen economy will ever be achieved.

Mobility: Resource rationing results in less travel generally and restrictions on what is acceptable travel; the cost is high for the trips that are taken. There are more centralized mass transit systems. With less consumption, there is also less need for the transport of goods.

Communications: As physical travel decreases, there is more reliance on telecommunications and the Internet. Most workers telecommute, and companies carefully monitor employees' home

behavior. Internet usage is also strictly regulated and monitored. This leads to a pervasive feeling of fear and unease.

Biotechnology: Biotechnology is not a driver of societal change in this world. In fact, biotechnological advances are stagnant in this world.

Business

Business looks to government for guidance and readily accepts a command-and-control relationship. Regulations are widespread because of prior environmental disasters. Business ethics centers on environmental responsibility. In fact, a primary focus of business is regulatory compliance; in fact, this is more important than profits and meeting customer demands. Companies that are adept at handling government relations, such as drug companies, flourish. Financial markets are not very essential and there is little shareholder involvement in business. In fact, there is little public interest in business. Providing shareholder value is a low business priority. There is a shift to less resource-intensive products and services. Customers accept whatever products are available without much debate.

Society

While many see the necessity of the status quo, others feel it is coercive and unfair, especially since there is much cheating and black markets flourish. There are widespread tensions and jealousies over distribution of rations and permits. Opportunities are limited. Each new generation receives less than the previous generations, and there is a general downward spiral in the quality of life. There is a general sense of malaise, and as resources become scarce, some make a virtue of minimalism. Anti-materialism gains support, and Buddhism's influence expands.

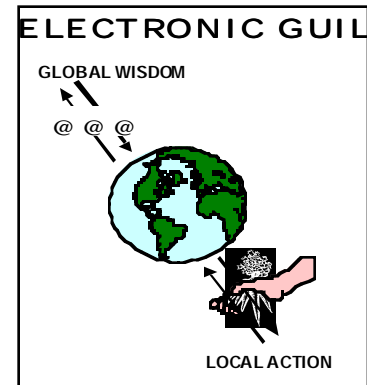
Academia and non-governmental organizations are weak. There is little public pressure on government because most people are self-centered and focused on their personal needs. However, individual scholars and top experts play a large role in influencing governmental and business actions.

SCENARIO: “ELECTRONIC GUILD”

This scenario is a world of trust where the dual focus is on culture and enlightenment. An example of this might be the Greening of Industry Network, which, though it has no real governance other than loose, mostly virtual interactions among the members, is an organization in which everyone is working towards the same value of sustainable development.

Environment

The status of the environment in this future world is determined by actions at the local level and enhanced by information exchange through the virtual, electronic community. Even with expanding population, air and water quality remain stable as a result of technological advances. People readily share the most up-to-date understanding of global warming and widely implement technologies to control it. There are fewer depredations on the environment, and remediation technologies to correct the remaining problems are developed and actively supported. Because of the global information network, there is an immediate awareness of, and a quick response to, local environmental disruptions.



@ = symbol for the Internet

There is more respect for natural habitats as well as different forms of animal and plant life; the animal rights movement is prospering. Communities manage the use of natural resources. There are targeted policies for land usage. Since everyone is aware of how things are used, a benevolent vigilance emerges to protect sensitive areas.

However, there are still a few cultures that cannot afford to change in the face of more urgent needs such as feeding their population. In some areas of North Africa, for instance, drought and massive famine preclude the implementation of sustainable technologies due to the lack of capital resources. These areas are not forced to adopt advanced technologies that they cannot understand or maintain.

Consumption

Because of shared knowledge, society understands the implications of consumption. People are conscious of their own impact on the environment and take steps to reduce their demand for products and goods. Conspicuous consumption is substantially reduced. Awareness of the consequences of consumption results in behavioral changes and thus a leveling off of greenhouse gases. For example, people no longer have front lawns, minimizing the use of chemicals that pollute ground water. Housing density has increased, reducing land usage impacts. More effective resource use leads to increased material efficiency per person, although this gain is somewhat offset by population increases.

Products are customized to meet individual needs, at least within cultures, but there is a significant shift from an ownership model to a service model, with products built to support the service system. Personal vehicle ownership decreases and is replaced by an increased reliance on shared vehicles and public transportation. People consume local goods, but global services. The local goods are tailored to meet local needs.

Technology

Technology is viewed as the means to meet basic and particular needs in this world. As new needs are recognized, technology is developed to meet those needs. Technological development is viewed as the responsibility of all sectors of society (government, industry, universities, etc. New technologies are rapidly embraced and seen as adding the value and quality of life. This viewpoint means that new technologies are readily accepted and adapted to meet local requirements. Access to technology is freely available and so is more equitably distributed.

Research and development move away from supporting the military-industrial complex toward efforts that support basic human needs. No hierarchy or single player “manages” this process. Local groups within cultures define their needs, tap the global knowledge base, and then add local expertise and content to create answers that are locally implemented. People are also more aware of the costs of technology development and factor in this knowledge when developing solutions. Local innovations become a new part of the global knowledge base.

Regulation has become less relevant. Advisory processes and market pressures are more influential than legal requirements. Alternative technologies spring up from non-traditional sources, which are often overlooked by regulatory forces. Knowledge of best practices and dissemination of information has led to the elimination of inefficient and environmentally destructive processes because alternatives are so readily available.

Previously disenfranchised individuals and groups with alternative viewpoints and ideas are now empowered to contribute to mainstream innovations. Innovations from indigenous populations (e.g., local organic farming techniques in Central America) are recognized and respected as a new resource for technological advances, supplementing traditional institutional sources of knowledge.

Energy: A general level of support for environmentally conscious energy choices leads to renewable energy being favored. Although overall energy use rises, the proportion of clean energy rises dramatically and is accelerating. Technological innovations reduce energy and resource consumption.

Mobility: Forms of mobility reflect local needs and support the functional requirements of a given society. Traditional vehicles become less relevant as mobility becomes interchangeable with connectivity. As information technology replaces traditional transportation, workplaces become more dispersed. With reduced need for roads, many roadways are returned to nature.

Communications: Information technology has broken down traditional institutional, cultural, and geographic barriers. The Internet is freely available to all countries and cultures and facilitates community interaction. Everyone has instant access to custom-tailored programming; community websites are also available and make the Internet locally relevant. The perceived local relevance and usefulness of the Internet ensures its universal presence; wireless access is common. Telecommunications and the Internet also accelerate the adoption of practices from nontraditional sources, contributing to increased alternatives and choices.

Biotechnology: The pressure to feed everyone who is alive leads to increased reliance on technologies like genetically modified organisms.

Business

In this world, business is an extension of family and community. Most companies are managed by a bottom line that incorporates sustainability; they work closely with government, academia, and other groups to achieve this. Businesses focus on knowledge capital and innovation in business models. Profitability is achieved by value creation. Traditional capital markets are less influential. Web-based capital is available for innovations that improve environmental or social conditions. Loans and investments are based on longer-term returns and societal value as well as economic value. The concept of micro-credit is embraced by business; this idea was first popularized among the villages of India as a way to meet basic human needs and improve the quality of life.

Businesses are driven from the bottom up. Locally identified opportunities and requirements drive global thinking and the global system for meeting needs. Web-based, multi-markets improve the efficiency of the marketplace. In addition, they enable businesses to identify and respond to newly emerging needs much more quickly.

Global information networks lead to a variation on the concept of “neighborhood watches” to prevent environmental abuses by business. These groups work toward consensus in a positive environment of creative tension.

Businesses significantly reduce the use of “dirty” energy. With cleaner, more efficient processes, greenhouse gas production is reduced and less energy is spent on packaging and shipping products. Regulations are well thought out and follow market-based restraints.

A new business model based on sustainability emerges. In the developed world, there is no more planned obsolescence and resource-intensive products are carefully scrutinized. By-products have been eliminated from the product cycle; in many cases, the by-products become raw materials for other products. Certain toxic elements are no longer used. The developing world has become a source of innovation for sustainable food and energy production and use. Although these countries continue to generate pollutants, they take advantage of the connected world to gather information from the developed countries to help them avoid pitfalls and use leapfrog technologies in their economic development.

Society

The bandwidth of economic equity is widened: more people lie within the range of a decent life within their particular cultures. Pockets of ignorance still exist within each culture, however, regardless of the level of affluence. There continue to be “have-nots” who are unconnected to global information, skills, wisdom, and markets. However, there are many more “haves” who are connected to global information and thus have the ability to meet all their material wants consistent with their particular culture. This is defined as “material decency,” i.e., access to a decent minimum standard of living. Put another way, a rising tide raises all ships. Access to knowledge is available to all and innovations are freely distributed worldwide.

Age is a chronological concept, not a major division in society. Personhood is defined by “what I do”, not “what I have”. There is mutual respect among different generations, a concept emphasized within the framework of most cultures’ beliefs. The worldwide network serves to bring everyone together, combining the innovative spirit of the young with the experience of the old. There is also more opportunity for the young to find work locally, so there is not as much

physical movement of people from place to place.

There is greater total productivity over individual life spans (Figure 6). In the past, in all cultures, a person learned and added to society through mid-life, then entered a long period of decline until death. In the world of the "Electronic Guild", it is easier to continue learning and contributing even more in later life. With the increasing capability of medicine, people in all societies have more vitality until the end of their lives – which gives them more opportunity to contribute.

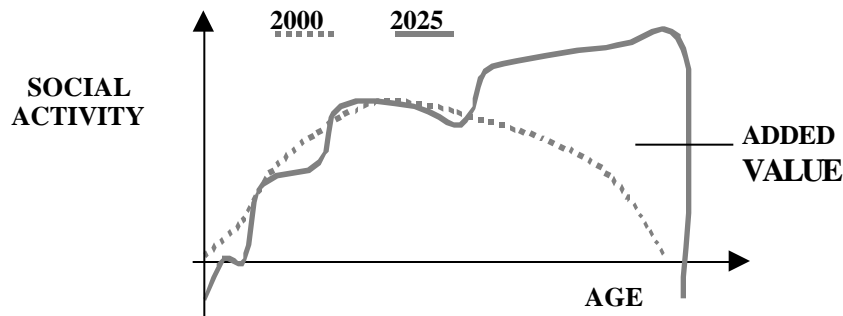


Figure 6. The difference between 2000 and 2025 in total productivity over individual life spans in a world of the electronic guild.

The trend of non-Western cultures to adopt Western ways has declined, particularly with regard to conspicuous consumption. In fact, non-Western attitudes gain ground, particularly those emphasizing the importance of family.

Government, non-governmental organizations, and business are partners in maintaining society's interests; traditional barriers between these organizations blur. People are not as reliant on government as the arbiter and agent of change. Government acts more as a guide and mentor, leveraging global wisdom. It also serves as the focal point for collaboration among institutions. The United Nations is replaced by the United Sister Communities Organization (USCO), which focuses on sustainable development. Academia identifies, creates, and develops new collaborative opportunities between governments, businesses, and communities.

SUMMARY AND CONCLUSIONS

Workshop attendees participated in the steps of an Envisioning process. After an overview of the process, three speakers challenged attendees with provocative thoughts about environmental issues to expand their thinking and focus and to help them think divergently about this complex topic. Participants were then given a basic framework of four future scenarios developed by an internal General Motors Envisioning team and used with permission of GM for this collaborative effort. The scenarios and the uncertain forces of change were used to explore how issues might play out differently in each of the future worlds.

The major activity of the workshop then consisted of participants in four teams developing insights into: the status of the future biosphere and societal attitudes around consumption, technology, and business policies and philosophies. A valuable source of research for this activity was the two GM-GIN project surveys. A key aspect of the process was to have participants from different scenario teams at selected times during the process discuss their perspectives on why issues might play out in alternate ways thereby helping the group challenge their normal assumptions and thought patterns, surface new ideas, and build shared visions.

The following conclusions were drawn:

- Environmental sustainability can be equitably achieved globally in the future by different mechanisms. In one future world with centralized governance, sustainability can be achieved because each society demands it of its large institutions. In another, sustainability can be achieved because of the global information network that enables the free flow of information and awareness of local environmental events. The network also enables the sharing of knowledge of and information about remediation tools.
- Similarly, local environmental sustainability can vary and can also be achieved differently. In a future world with centralized governance, environmental issues loom large and threatening but can be dealt with by rationing of natural resources, energy, and allowable emissions. In a future world with distributed governance and unique societal routine taxation of all resources can be used to encourage efficient environmental resource usage.
- Conspicuous consumption, although viewed today as a way of life that leads to resource depletion, can be a behavior that drives innovative development of substitute materials, efficient designs, and alternative resources. The scenarios show the breadth of ways consumption may evolve. In future worlds that have centralized governance, consumption is constrained in two different ways. In one world the government rations goods to reduce resource use and motivate innovation. In another world more consensus among consumers about reducing consumption leads to less individualized products.
- Technology continues to be valued and is viewed as the major mechanism for handling environmental challenges. How technology is funded and managed in the future varies. In a future with strong centralized governance, large-scaled bureaucracies drive technologies because coordinated action plans can be quickly implemented once a consensus is reached. This approach allows and requires major investment that is supplied by both government and

business. In an alternate future world, technologies are government-driven but slow because they focus on technologies that improve efficiency and enhance conservation efforts rather on achieving dramatic breakthroughs. The drawback to this approach is that large consortia are the major obstacles to nimble development and fast implementation of both large and small-scaled technologies. In a third world, short-term technologies that offer the greatest and quickest paybacks are highlighted. The downside of this approach is that large-scale and long-term horizon technologies (such as hydrogen fueled transportation) are de-emphasized. In the fourth and final scenario, technologies are viewed as the means to meet basic and particular needs. Regulation becomes relevant because local innovations become a part of the new global knowledge base.

- Businesses in one world have strong boards of directors that provide socially responsible consensus governance. Systems science is applied to improve business management and dispute resolution in this world. In an alternate world, a command-and-control relationship exists between government and business. In a third world, self-interest drives and the market is fragmented between those who want socially responsible products and those who are conspicuous consumers. In the fourth world, business is seen as an extension of family and sustainable communities. Global information networks form a variation of the “neighborhood watch” concept to prevent local environmental disasters.
- Notably, in each future world, improvements to mass transportation are required as a key feature of mobility solutions. In one world different forms of transportation (such as personal vehicles, bus, train, and air) are integrated to solve mobility concerns and to ensure speed, convenience, and energy. In a second world, there is limited ownership of vehicles and more usage of mass transit. This occurs because people pay for and only use transportation services based on their immediate needs. In a third world, travel and commuting are restricted or even rationed. Costs are high and only certain forms of transportation are viewed as acceptable by governing bodies. And in the fourth world, mobility becomes interchangeable with connectivity in a future where societies share values. Traditional vehicles are viewed as less relevant because information is exchanged online. Accepted forms of mobility reflect local needs and support the functional requirements of a given society.
- Of the four future worlds, the “Regulated Limits” scenario was most. Most attendees preferred to work on another team; they found this world depressing. This potential world presents the most difficult challenges for meeting future global environmental and societal needs, yet would benefit from having a proactive contingency plan to meet the potential challenges.

ACKNOWLEDGMENTS

The authors wish to recognize the support and assistance of Kurt Fischer, Theo de Bruijn, and Ellis Immerzeel of the Greening of Industry Network; Cynthia Schleicher, Nathan Spunt, and Charalet Dunnigan of GM Corporate Strategy and Knowledge Development; and Lerinda Frost, Sam Mannino, and George Nouaime of GM Research & Development and Planning. We also thank each of the GIN and GM participants and the facilitators, Nathan Spunt, Cynthia Schleicher, Ron Williams, and Dexter Synder, for their contributors to the success of this workshop.

REFERENCES

Coates, J.F., Mahaffe, J.B., & Hines, A. (January, 1996). *2025: Scenarios of U.S. and Global Society Reshaped by Science and Technology*. Oak Hill Press.

Elnick, A.B., Blair, J.A., Rogers, J.D., & Dunnigan, C.J. (April, 2000). *Envisioning the Global Environment in 2025: Survey 2 Response and Analysis*. GM Research & Development Center Publication R&D - 9086.

Inglehart, R. (1997). *Modernization and Postmodernization: Cultural, Economic, and Political Change in 43 Societies*. Princeton University Press.

Ringland, G. (February, 1998). *Scenarios Planning for the Future*. Wiley.

Schwartz, P. (April, 1996). *The Art of the Long View: Planning for the Future in an Uncertain World*. Doubleday.

Van der Heijden, K. (September, 1996). *Scenarios: The Art of Strategic Conversation*. Wiley.

APPENDIX A

Provocations

AMERICA'S SUSTAINABILITY CRISIS

Philip J. Vergragt
Delft University of Technology
Delft, The Netherlands

The enhanced greenhouse effect has led to an enormous increase of rainfall, storms, and floods in the Northern Hemisphere, especially in Western Europe. Under this pressure, European governments went ahead and signed the Kyoto Protocol in 2002 and moved forward in their environmental legislation for companies. Moreover, consumers became more and more aware of the relationship between climate change and their lifestyles, and complied with drastic lifestyle changes diminishing greenhouse gas emissions. Services replaced products; transportation diminished, replaced by sustainable transportation; and bio-agriculture, renewable energy, and supply chain closing led to a drastic reduction in environmental burden.

India and other Southeast Asian countries are so impressed by European performance, that they shift their policies towards massive collaboration with the European Union in terms of sustainable technology development. Massive technology transfer resulted with support from the World Bank and the Asian Development Bank. China follows at a somewhat slower pace.

Europe-based multinational corporations are flourishing; the Euro goes up steeply. American multinationals see a steep decline in their performance, their trade, and their technological positions. In order to stay in business, they massively move to Southeast Asian capitals like Delhi and Bangkok, where they have a better opportunity to keep up with the Europeans.

The result is that the United States itself is left with a massive threat by climate change, steeply raising prices for energy, consumer goods and services, massive unemployment due to the moving away of multinationals, a weak dollar and thus fewer opportunities for import as well as travel abroad, and a feeling of isolation from the rest of the world. Although there is fear that the economic crisis in the USA affects the rest of the world, this is not happening, and the USA suddenly stands alone in the environmental and economic crisis.

Anti-globalization movements acquire a momentum, and broad layers of the population support the left-wing ecological program. In the run to the next presidential elections, the Democratic Party is happy to nominate the elderly Ralph Nader as its candidate.

THE CHANGE OF MEANINGS: FROM 2000 TO 2025

Simona Maschi
Polytechnic University of Milan
Milan, Italy

FLOWS

2000. People, goods and information determine movements and flows.

2025. Flows determine movements of people, goods and information.

The place is structured in three main kinds of flows: people, goods, and information

2000. Systems of goods' production and delivery are organized according to marketing categories: food, pharmaceuticals, electronics, cars, furniture, household appliances, etc.

2025. Systems of goods' production and delivery are organized according to "situations of use".

The combinations of goods respond to these situations through a performance-oriented approach.

OWNERSHIP

2000. The economic paradigm is based on products and services. People think it is important to own things.

2025. The economic paradigm is based on a network of services, and the availability of things fades into the background. It is not the ownership of things that counts, but their availability when needed.

RANGE OF PRODUCTS

2000. Products in the market show a limited mass-customization approach. People are used to choose "in between...".

2025. Products in the market are combinable components. The range of products is not decided at the manufacturing level, but at the production end by consumers.

MANUFACTURING

2000. The production of industrial goods is concentrated in big, medium and small size businesses. Technological and organizational platforms respond to efficiency criteria in terms of life-cycle-cost.

2025. The production of goods is spread out all over in micro, on-site production points. People decide how, when and what has to be produced. Design and manufacturing processes are the result of the integration between the two ends of the production systems, that is, the sector that makes components available and the users who complete the process.

VISION: CLOTHING CARE IN 2025

Clothing care is not a household chore and is totally provided by services. Members of the household wear clothes, but they don't care for them. Clothes do not form part of the household elements; they can be used for a fixed period and afterwards exchanged. Since clothes are instruments which offer protection, comfort and communication, what counts is not their property, but the regular and constant availability of clean clothes according to consumers' specific needs: *i.e.*, 10 pairs of pants, 10 pairs of socks, 7 white shirts, 2 pairs of trousers, 2 jumpers and 1 jacket a week, 1 raincoat every 4 months, 1 coat every 2 months.

Clothing care activities within the household do not concern appliances and processes any more. Clothing care facilities (durables and consumables) are not located at home; they are not

privately purchased or rented. An external service guarantees professional and suitable solutions for providing, cleaning and repairing clothes. Each member of the household formulates a solution of clothing and clothing care that he or she desires. Basically each answers four main questions:

1. Which clothes do I need?
2. When do I want clothes to be cared for?
3. Which performance of clothing care do I want?
4. Where can I leave or pick up my clothes?

The shift from the purchase of clothes to the purchase of availability of clean clothes implies a great change in the clothing care panorama. A new mix of products and services is offered to consumers. Producers of clothing and a new form of private organizations form a new supply chain combining different activities: distribution and collection of clothes, cleaning centers, repair and re-manufacturing centers.

The new relation between customers and clothing starts with the shopping that is not finalized with the purchases but with the choice of clothes that the customers wish to wear. They can go through stores and choose both clothing and clothing care conditions they would like to get. That means: how long are they going to have their availability, how clean clothes should be folded or perfumed, condition of payment, place and time of collection and delivery, and so on. After clothes have been worn, the cleaning center will manage their care. In the case of a hospital or a garage, they are centers working on the "health" of clothing in the most professional way. If necessary, clothes will be repaired or partly remanufactured (e.g., dyeing, substitution of parts, up-grading). The clothes will be delivered at home according to customer requirements.

Time freed up for consumers has greater economic value than the cost of the services.

WHEN OIL AND TOBACCO BECOME ONE

Jacob Park
Friends, Ivory & Sime
Washington, DC

It is the year 2025; the apocalyptic vision of global climatic change has become all too real for the developing world, particularly for the small island nations. The residents of Maldives Islands, for instance, have had to flee their homes to India and other neighboring nations as their homes have all been submerged under seawater.

Meanwhile, the business prospects for multinational energy corporations could not be better. Enron continues to be the world's most innovative leader in the electronic-based weather derivatives and carbon abatement solutions, while BP Exxon Shell have the same market share - and profits - as Microsoft used to have in the PC software market. TotalFina, the French oil company, refuses to listen to merger overtures from BP citing "Anglo-American oil imperialism."

The big cloud hanging over the international petroleum industry, and virtually the only thing that worries Wall Street/CNBC stock analysts and commentators, is the series of lawsuits filed in the New York District Court by environmental/human rights NGOs and a group of developing countries (who are most affected by climatic change). The suit charges that multinational corporations have conspired with the U.N. and various national governments to minimize the dangers posed by global warming under the guise of "scientific certainty" and "good science."

The lawsuit seeks damages of \$1 trillion from the energy multinationals, plus the appointment of an international tribunal to consider bringing criminal charges to present and former CEOs of the major energy/oil companies.

As a way to build public support for the lawsuit, the environmental/human rights groups begin airing public service announcements of congressional testimonies of energy/oil executives in the late 1990s who argued that "we don't know enough about the science of climate change" to take any actions, while showing video clips of millions of "environmental refugees" from Bangladesh and other countries whose homes have submerged under water and are dying by the thousands due to various waterborne diseases.

APPENDIX B

TEAM TASKS

TASK 1 The Future Global Environment

The status of the biosphere & ecological systems.

Describe the status of the biosphere this world:

- How is the quality the air and water supply?
- Are natural resources readily available? Where?
- How has bio-diversity changed?
- Have any environmental disasters occurred? What kind?
- What is the status of global warming?
- To what extent is there a shift away from land used for natural habitats, forest cover, or agricultural production?
- How much energy is consumed? Is the energy derived from renewable or non-renewable sources?
- To what extent do social choices lead to greenhouse gas (GHG) accumulation (e.g., from carbon dioxide emissions)?
- What byproducts of goods and services act as pollutants in air, land, and water?
- To what extent will new technologies abate or circumvent environmental problems?
- What are the tradeoffs? For whom?
- What and where are the tensions?

TASK 2 Consumption

The utilization of economic goods in the satisfaction of wants and needs; the process of production resulting chiefly in the destruction, deterioration, or transformation.

Describe consumption in this future world.

- What does it look like - what are the human needs and desires?
- What is the status of the "Haves" & "Have-nots"?
- What is the status of the "Young" & "Old"?
- Where is consumption different around the world? Describe consumption in the North, South, East (Asia), West (North America & Europe)
- What are the equity questions?
- Are there specific materials and resources that have been impacted?
- Has this result in dematerialization (use of fewer resources: material and energy)?
- Are Green House Gases (GHG) an issue? If so, how?
- Do regulations play a role; globally, regionally, nationally? Should they?
- What are the enablers and facilitators? What are the barriers and obstacles?
- What are the tradeoffs? For whom?
- What are where are the tensions?
- What forces have shifted or changed the issues around consumption?

TASK 3 Technological Breakthroughs

Technology advances have the potential to improve the environmental friendliness of products and processes by making them cheaper, cleaner, and more efficient.

Describe the status of technology and research & development in this world.

- What are the major sources of energy? What technology supports these?
- What are the major forms of mobility? What technology supports these?
- What are the major forms of communication? What technology supports these?
- What is the status of biotechnology?
- What are the environmental technology innovations?
- Where in the world have these technologies and innovations been developed?
- Who are the major "players" promoting or blocking technology development?
- Who manages the process? Who takes the lead?
- What are the enablers and facilitators? What are the incentives?
- What are the barriers and obstacles?
- How is access to the advances made available? Globally? Regionally?
- What is the role of the Internet?
- How have new ideas become technological breakthroughs?
- How has transport changed? For businesses? For individuals?
- How have technological advances been incorporated in automobiles/vehicles?
- What has happened with "genetically modified organisms"(GMOs)?
- How have regulatory actions impacted technology choices?
- How have regulatory actions impacted adoption of alternate technologies?
- How has consumer awareness of alternate technologies been generated?
- How does consumer awareness impact adoption of technologies?

TASK 4 Changing Business Operating And Management Philosophies

Companies are including environmental costs in their bottom line, broadening their business purposes and including sustainability at the "boardroom" level.

Describe business operating and management philosophies in this world.

- Are the operating & management philosophies different? Describe new philosophies.
- Did environmentally responsible business practices develop? If so, describe.
- Have business ethics changed? Describe?
- Have shareholder value been impacted? How?
- What are the major types of companies in operation?
- Where in the world/business did these philosophy changes take place?
- Are there equity questions?
- Is there public pressure? Where does it come into play?
- Why did business/industry change?
- How are financial and capital markets influenced?
- What market-based policies have resulted?
- Are regulatory policies voluntary or reflexive regulatory? Why? Where?
- What role does government play?
- How does academia influence these changes?
- What are the non-governmental forces?
- What competitive actions led to a shift in business philosophies?

APPENDIX C

GIN OPTIONS TO ADDRESS FORCES OF ENVIRONMENTAL CHANGE

The members of the workshop were asked to suggest how GIN could address the forces of environmental change identified in the GM-GIN surveys.

Improve Web-Site & Information Management

1. Create a space where anyone can post questions or problems and network members can post suggestions or answers (Bulletin board of discussion).
2. Create a “switchboard” to match expertise with needs.
3. Publish and keep current:
 - A list of research interests
 - On-going research
 - Past work of network members
4. Create a section that highlights GIN success stories (Boast if the sustainability initiatives influenced legislature).
5. Create a section that lists Bibliographies of GIN members. Organize by member’s specialization.
6. Allow members to register electronically.
7. Develop a database on expertise and research/practice interests of network members.
8. Post a summary chart of network member fields (academic, agriculture, chemical, environment, finance, government, industry, oil, pharmaceutical, student, telecommunications etc...) Use this information to try to increase membership of underrepresented fields. This will give the network a balance as well as an influx of new ideas.
9. Create an interactive web site like Sim City that shows the sustainable life cycle consequences of everyday decisions.
10. Create an issue of the month section.
11. Highlight a best practice case every month.
12. Define what sustainability and sustainable development means (give examples).
13. Provide a mechanism to connect researchers with companies and government organizations that want access to new technologies for solving environmental problems.
14. Commercialize GIN.com as an information exchange (have corporate sponsors finance the site).

Sponsor Environmental and Sustainability Education

1. Identify business schools that address environmental and sustainability issues in their curriculum (include a best of b-school list on the web-site).
2. Create environmental and sustainability case studies for business schools.
3. Create a course that weighs the social outcomes of energy design decisions.
4. Develop course material for 2nd world secondary education that teaches social responsibility in a local context.
5. Develop a modular teaching course on sustainable innovation, design for sustainability, and policies for sustainability.
6. Make the four scenarios and related material available for classroom use.
7. Build and share easy to understand global models that effectively communicate issues at hand.
8. Promote early environmental education at the k-12 level.
9. Create a “tool-kit” of information that can be used (sold to?) teachers to improve their environmental knowledge (for k-12 students).

10. Create an undergraduate GIN class
11. Set-up an exchange-network for Ph.D. students.
12. Use classroom setting to continue to breakdown cultural and nationalistic views that do not favor the environment.
13. Use classroom setting to build consensus on the “right answers” to environmental issues.
14. Businesses need to incorporate “Environmental Literacy” in their job descriptions. This will filter into curriculums by putting the environment on the Dean’s agenda.
15. Curriculums should carry the same basic message, which is that the current western value system is not sustainable.
16. Focus research on profitable pro-environmental enterprises to attract investors.

Sponsor New Research Projects

1. Define what sustainable development means? Give Examples.
2. Develop a science of triple bottom line accounting that weighs social, economic, and environmental costs and values on the same scale.
3. Design a system of sustainable mobility (technical, social, & cultural).
4. Study the interaction between basic well-being and subsistence food practices and appropriate sustainable technology practices that “might” enhance well-being in their local context.
5. Collect best practices by industry type (place results on GIN’s web-site). Identify non-sustainable intermediate social steps and devise alternative paths for social progress.
6. Identify non-sustainable intermediate social steps and devise alternative paths for social progress.

Increase Publishing & Publicity Activities

1. Sponsor joint publications with companies (rather than just academic books).
2. Develop a more active publishing program.
3. GIN should collaborate with Ken Burns (GM) on broadcasting a sustainability series on public television.
4. Publish more reports through different media channels (Internet, books, journals, magazines, etc...)
5. Publicize efforts not only successes (Ex. Class room support)
6. In order to grow the network GIN Members should attend key conferences and seminars wearing a GIN badge.
7. Produce a disaster movie that highlights global warming consequences.
8. Promote “environmentally friendlier” habits at a local level. We must change the value system at the consumer/personal level. Demonstrate environmental value.
9. The world of managed change suggested the need for some new sciences in valuation, etc. GIN could spread the word.

Grow the Network

1. On the GIN web site, post a summary chart of network member fields (academic, agriculture, chemical, environment, finance, government, industry, oil, pharmaceutical, student, telecommunications etc...) Use this information to try to increase membership of underrepresented fields. This will give the network a balance as well as an influx of new ideas.
2. Change the name of GIN to Sustainable Industry Network (SIN).
3. Bring together people from different cultural / regional backgrounds (nurture diversity, widen the debate).
4. Have a contact person for non-members.
5. Create a financial basis.

Expand GIN's influence

1. Create a consulting organization or federation to help businesses, trade associations, governments, or NGOs.
2. Encourage large corporations to promote environmental education.
3. Help create formal and informal institutions to influence business decision-making.
4. There should be a greater emphasis on implementing GIN ideas and knowledge to industry and government.
5. Network on environmental issues: Rally the public to conduct environmental pilot programs in their communities.
6. Identify, cultivate, and educate evangelists to promote sustainability in member companies and key industries.
7. Create a volunteer field service to send business people into the third world to create sustainable practices.
8. Develop channels to transfer sustainable technology to developing societies.
9. Encourage members to participate on trade/government committees to represent network views (The U.S. Department of Commerce Committee on Trade and the Environment is looking for an "environmental" member).
10. Encourage businesses to develop appropriate technologies that promote sustainable practices in the developing world.

Develop Capacity Building Partnerships

1. Partner with a widely know organization (e.g. Environmental Defense) and become the impartial "science" source on issues.
2. Find and collaborate with other NGOs that have similar business-environmental missions and work together.
3. Develop partnerships with interested organizations.
4. Develop strategic alignments with CERES, GRI, and Business for social responsibility.
5. Target some activities on the connections between production and consumption.
6. Identify potential sources of help in the financial sectors.
7. Solicit business to jointly fund research projects for joint benefit.
8. Assemble teams to create and conduct sustainability experiments with business, government, and others.
9. A more sustainable Wall Street: Work with public investors to design a criterion that values environmental initiatives for company's market value.
10. Partner with Dow Jones index.
11. Find a partner to underwrite participation of non-profits and participants from non-OECD countries.
12. Engage in an experiment of multi-stakeholder innovation (in mobility, shelter, consumption, tourism).

Improve and/or Change Conference Structure Workshops

1. Hold more joint meetings with specific industries to discuss solutions.
2. Identify boundary crossing forums where people / key stakeholders in sustainability come together.
3. Hold a workshop on environmental policies and industrial innovations.
4. Conduct Envisioning sessions with industry groups (focus on the cascade issues).
5. After Bangkok and Gothenburg do not hold any more big conferences, instead have many

smaller meetings.

6. Hold annual workshops with different industry sectors.
7. Host a conference for business and government to come together to envision sustainability collaboration.
8. Facilitate meetings / projects around specific supply chains (Greening of supply chains).

Work with Government / Corporations

1. Too much focus on centralized governments. GIN should work closer with corporations who can address sustainability issues.
2. Replace me as a pen pal of environmentally enthusiastic people in companies around the world.
3. Promote the exchange of environmental information between developed and under-developed counties.
4. Understand key first world messages that lead to non-sustainable 2nd world practices and lobby industry to change.
5. Establish consumer product ratings for compliance with best green practices.
6. Improve LCA to include toxins, not just VOC, energy, water.

Focus GIN's Agenda

1. Applied Research: Explore Trade Ecological Knowledge (TEK) and "Ecological Embeddedness," as a source of ideas and principles for business strategy.
2. Advance an agenda and process for the social aspects of sustainability.
3. Focus on system-wide change.
4. Focus on agenda setting activities.
5. Allow time for more brainstorming to come up with new ideas and visions.
6. Focus on the key problem of climate change for the next five years of meetings.
7. Encourage members to get first-hand knowledge of India, Africa, and Indonesia by traveling there for at least 6 months.

Improve Services for GIN Participants

1. Setup internships with GIN professors.
2. Help industry participants identify specific roles for themselves in GIN.

APPENDIX D

GIN STRATEGIC PLANNING OPTIONS

The members of the workshop were asked to discuss GIN's options for moving forward. The group discussed high priority topics identified in the activity documented in Appendix C.

1. Focus GIN Agenda

- agenda should focus on ecological efficiency and system level change. GIN's
- efficiency can be worked on at the World Business Council for Sustainable Development (WBCD), GDMI, Society for Risk Analysis (SRA), Business Strategy and the Environment (BSE) conferences, and various clean prevention roundtables. Ecological
- organizations including the UN think with boundaries in mind. There is no forum for global system level thinking to create societal change. Many
- should look at where it can add value at a reasonable cost (How can it make a difference effectively?) GIN
- allowed Americans and Europeans to hear each other's perspectives on the environment and sustainability. This needs to be further branched out. Southeast Asia is a good start. GIN has
- wants to go to action, maybe it needs to take a different approach – target W2 / W3 opinions. It GIN
- disappeared what gaps would exist? Would people miss it? Why would they miss it? If GIN
- organizations lack environmental initiatives? What
- should leverage the legitimacy of this group by sponsoring other organizations with similar messages. GIN
- GIN's measure of success?
When they have collaboration?
When communication is distributed?
When people come back to GIN conferences? What is

2. Improve / Restructure GIN Organization

- GIN can become a hybrid organization with a more structured core. Maybe
- already worked on sustainability and how it relates to highly regulated industries. GIN could broker big opportunities with the 5/6 of the world that is not working on sustainability. Enormous gains can be made with awareness and training. GIN has
- should look for “partners” in other environmental circles. GIN

- assistance through experience and teaching Provide
- Provide credibility in academics through standards of excellence.
- GIN has traditionally acted as a loose coalition with little organization. Will adding
- structure to GIN undermine our objectives? Should
- GIN use outside consultants to rate GIN's effectiveness? GIN needs
- more representation from China and India. Which areas of the world do we want to concentrate on? Is our organizational structure suitable for that part of the world?

3. Create GIN Consulting Group

- want to consider having a consulting branch similar to what the WBCD has. This could be used to gain grants, partnerships, and financial capital. To begin this branch GIN could follow a venture capital model and explain what differentiates them from other environmental and sustainability groups. GIN may
- GIN as knowledge broker
- GIN as assessment committee consultant GIN as
- small business consultant There is
- no structure or interface to allow for this. Most of
- the suggestions on the wall deal with passive information exchange or small Conferenc
- es: Maybe it is time for a pilot effort to try an active mode.
- GIN should want to be facilitators of change.
- GIN
- should compile a list of significant organizations that do not have environmental initiatives and try to help them.

4. Increase the Interactive Nature of the Network

- the platform for people to get connected with environmental consultants. GIN has
- "space" for learning (platform to drive change) GIN gives
- 80% of
- GIN members are agents of change – they use GIN to implement change within their own organization. Therefore, GIN helps people leverage their own efforts.

5. Focus on Industry Alliances

- medium businesses have more capital to become green and sustainable than Large and
- companies. Do smaller
- Individual
- companies can take the lead on sustainable solutions for an industry issue (sustainability is an industry issue).

- chance in making a difference is to work with larger firms who appreciate long-term research. GIN's best
- Who
- should GIN partner with?
- What kind of organizations within Industry?
- What kind of partnerships do we need?
- How should partners conduct workshops and proceed with moving GIN's initiatives forward?
- Should GIN be worried about competition from competing entities? GIN needs to remain sensitive to competitors exchanging ideas. (Today GIN collaborates and cooperates with networks on the same mission)
- To what
- extent does GIN work to help companies become environmentally conscious?
- Why not
- couple with WBCSD or Eco-efficiency strategic alliance?
- Start a
- joint project with WBCSD?
- Value to
- GM
- Environme
- ntal viewpoints
- Sustainabi
- lity viewpoints
- Diverse
- input

6. Improve GIN Planning

- How does
- GIN envision society moving forward?
- How
- should GIN promote preferred routes and block non-preferred routes?
- Institution
- al issues need to be discussed by academics and business leaders.
- It's
- valuable to have cross-functional people contributing to GIN's work. We've been operating with an open platform for over a decade. It's now time to evaluate how to continue.
- Interested in discovering how people learn and how that learning translates into actions.