

RISK AND VISION

David W. Rejeski
Future Studies

U. S. Environmental Protection Agency (PM-222A)
Washington, DC 20460

With the exception of a few primitive cultures without time perspectives, a curiosity about the future has infected all major civilizations. Each culture has had its seers, prophets, shamans, and oracles and virtually all cultures have developed images of the future (both utopian and dystopian) as mechanisms of self-renewal and self-correction. Plagued by uncertainty and driven by curiosity, human beings have been particularly inventive in their search for predictive tools, using such approaches as hepatoscopy (the inspection of animal livers), cleromancy (divination by lot), lithology (divination by throwing stones), astrology, and the visiting of oracles. Mesopotamian priests, long before the time of Christ, regularly evaluated the possible impacts of proposed technological projects. The Judeo-Christian tradition of prophecy was built on the conditional if-then exploration of future actions. Finally, the development and explorations of alternative futures is within the broad tradition of scientific objectivity described by philosopher Israel Scheffler as requiring the "possibility of intelligible debate over the merits of rival paradigms."

Given the historically demonstrable demand for foresight, one can question where our present-day search for oracles will lead. Has science taken over the social purpose of religion and myth in providing predictive guidance? If so, few scientists would readily admit to their new role, nor do they desire it - fearing a blurring of the distinction between Newton and Nostradamus. Yet science is inherently predictive, seeking to help mankind avoid mistakes by guiding actions through simulation and anticipation.

Though the science of probabilistic risk assessment implicitly deals with the future by assigning probabilities to some future event (a nuclear power plant failure, the chance of contracting cancer, etc.), it is often poorly understood by the public or policy makers who have difficulties in evaluating low-chance events. This may be due, in part, to crucial differences in the type of rationality applied by scientists and lay-people in evaluating risky situations or problems in communicating risks between different societal subcultures.

Over the past decade, a semi-quantitative approach to ranking risks, often referred to as comparative risk, has gained popularity and credence. The attraction of comparative risk may well be that it mirrors the lay logic of relativizing a number of potential threats as a guide for action. Though rankings by scientists and the public may diverge, they do provide a basis for a dialogue concerning threats and policy alternatives.

One of the earliest attempts to compare risks was undertaken in 1980 by Dr. Gordon Goodman of the Stockholm Environmental Institute. Goodman evaluated a total of 29 environmental risks using 6 different criteria. This work was followed by an ambitious study by the Center for Environment, Technology and

Development (CENTED) at Clark University which focused on over 90 technological hazards as diverse as automobile crashes, noise from supersonic aircraft, and pesticides.

In 1987, the Environmental Protection Agency (EPA) undertook an internal study to rank 31 major environmental problems for which the EPA had statutory responsibility. This ranking was subsequently reviewed and evaluated by an external group of scientists who further developed the methodology for comparing environmental problems in terms of the human health, ecological, and welfare risks facing the EPA and other government agencies. The methodological approaches have advanced significantly and been applied in virtually all regional areas of the U.S., some states, and overseas. In addition to these studies, there are more qualitative, anecdotal risk rankings which have gained credence. One thinks, for instance, of E. O. Wilson's four horsemen of the environmental apocalypse: toxics, stratospheric ozone depletion, global warming, and finally Death - the unprecedented extinction of species.

In examining these comparative risk approaches one finds that considerations of the future are conspicuously absent. Most emphasize a "snap-shot" approach where risks are evaluated at a particular point in time, leaving future projections up to the imagination of the reader. An exception has been work by Bill Clark and his colleagues at Harvard which takes an explicit, cross-national look at future risks along the dimensions of future human health consequences, future ecosystem consequences, and the magnitude of future consequences.

The work done to date on comparative risk has surmounted enormous conceptual and methodological barriers and truly contributed to increasing the utility of risk-based approaches in policy making. The work, however, does not fully capitalize on the potential of social imagination. If such studies are to impact strategic planning and long-term policy making, they must deal far more explicitly with the future. This means going beyond a simple extrapolation of past risks to incorporate explicit, normative visions of the future. There are a number of reasons why vision will become increasingly demanded and must be included in comparative risk exercises.

WHY VISION?

1. Risk, risk aversion, and the circle of blame.

It is well known that most people are more risk averse when expected outcomes are negative, yet our entire risk assessment apparatus continually focuses human attention on deleterious impacts to human health and our environment. Barraged daily by media reports of morbidity, mortality, loss of valuable habitats, the extinction of species, and newly discovered toxic threats, it is easy to envision a growing "culture of risk aversion", where social imagination is replaced by litigious obsessions with blame and reparation, or apathetic withdrawal. Unfortunately, our society is openly adversarial in its dealings with human misfortune and often seeks out an "enemy" for punishment and compensation. Environmental policymakers pay a price for contributing to, and intensifying, a risk-focus in our culture. A risk-averse populace is far less likely to grant public institutions the flexibility and experimental, creative freedom to explore non-regulatory or voluntary approaches to

environmental management. The harbinger of the message becomes the message itself.

What if, instead, we estimated the risks associated with positive outcomes? Can we alter the risk analysis process to more fully capitalize on human imagination - creating visions of the worlds we could inhabit and then examining the environmental risks avoided by moving down certain paths of social, technological, and economic development? In taking this approach, we are forced to address fundamental questions of human existence such as the way we will live, grow our food, produce our energy, move about, work, process our wastes, etc. We would also provide a fundamental framework for effective strategic planning, using visions to explore and develop long-range objectives, goals, measures, and appropriate strategies and policies.

Philosopher Mark Sagoff recently commented that "Environmentalism has traveled a long road since the 1970's...In moving from a preoccupation with technological threats to personal safety and health to a larger concern with the sustainability of ways of life." The recent United Nations Conference on Environment and Development in Rio has underscored the belief, held by growing numbers of people worldwide, that environmental policy debates in the future will be built on the vocabulary and framework of sustainable development. Such debates must go beyond risk to address fundamental decisions concerning global, national, regional, and local paths for social and economic development, in short, "ways of life" questions.

2. Eroding scientific legitimacy and the decline of deference

Since the end of World War II, we have witnessed a significant decline in the absolute legitimacy of science. Harvey Brooks has commented that, "scientists today are listened to much more but believed much less than they were in those heady days...the image of objective, 'value-free' science and scholarship is severely tarnished." The suspicion among policy makers of scientists was echoed even earlier by Winston Churchill, who once remarked that "scientists should be on tap, not on top." Increasingly, the scientific community itself is raising the fundamental issue of whether we are asking questions of science which cannot be answered by science.

Viewed historically over the past four decades, the unquestioned legitimacy of science has given way to civil legitimacy based on negotiated agreements. The intrusion of the public into scientific debates has eroded the very meaning of science as a consensual, peer-oriented activity within a closed sub-culture and has surfaced the contradictions between science and democracy. This trend has been accelerated by what some social scientists have termed a 'decline in deference,' a decreased willingness on the part of the public to defer decisions to scientists and public institutions. Nowhere has this phenomena been clearer than in the area of risk assessment, where increases in scientific understanding have been greeted by growing skepticism and resistance on the part of the public. Significant investments in risk communication, though helpful and needed, have not (and will not) overcome what is in essence a cultural struggle over power, legitimacy, authority, trust, and the rights of individuals.

Recognizing this dilemma, some countries like Canada have adapted more participative, consultory processes (roundtables) aimed at addressing issues and questions which transcend science and require the reconciliation of individual, community, and societal goals. In the U.S., the Globescope Americas project has a similar participative focus - to bring together a wide range of stakeholders and make sustainable development the foundation of decision-making in the United States by the end of the decade.

In future policy making forums, scientists will be one part of a wider decisionmaking community where legitimacy will be constantly questioned and vision demanded. At a global scale, the crumbling of nation states, the retreating convictions and institutions of the cold war era, and the blurring of distinctions between sacrosanct policy areas will all increase the demand for greater democratization in decision making, throwing into question the future role of science. As former Czech President, Vaclav Havel, has noted, we all may be forced to "abandon the arrogant belief that the world is merely a puzzle to be solved, a machine with instructions for use waiting to be discovered, a body of information to be fed into a computer in the hope that, sooner or later, it will spit out a universal solution." In the final analysis, organizations which are heavily dependent on science and science-based analysis for their legitimacy may have to reexamine their methods and mission in the context of existing and emerging democratic structures.

3. The language of community versus the language of anonymity.

The growing popularity of the risk paradigm has been linked to the evolution of a global society and specifically with the ability of globalization to draw people out of small local communities into larger regional, national and international spheres. For this to occur, we require a context-free and anonymous symbol system which can support the growth and spread of undifferentiated, large-scale, culturally homogeneous communities. Risk as an abstract, reductionist, scientific symbol set may be as close as we can come to realizing the dream of a universal world language. Risk combined with economic quantification (risk/benefit analysis) may be the ultimate tool for the abstract transcendence of local culture.

The use of the risk language becomes tenuous, however, if the culture state takes precedence over the nation state or if the local community is viewed as an important locus for the mobilization and implementation of environmental change. If the role of environmental organizations becomes one of improving the lot of real people living in real places, then the language of environmental policy can no longer be one of anonymity, homogeneity, and amnesia. We will need a language which is rich in history, context, uniqueness, and place - a new language of environment and community focused on common aspirations and social cohesion. The inability of risk to adequately address issues of environmental justice raised by local, grassroots groups is an acute reminder of our increasing language deficiencies.

4. Growing demand for vision

A recent poll taken by the Washington Post and ABC News

produced some interesting results. Tied with concerns about pollution and environmental problems was the perception that visions were missing and the long-term needs of the country were not being addressed. Some people have maintained that we need in "fresh face", a new set of strategies and visions for an emerging global era.

There are a number of possible socio-cultural explanations for this lack of long-term vision, including recent observations that we are ending a crucial phase in history, crossing over to another, or captives of a contented culture which values short-term public inaction (regardless of the seriousness of the long-term consequences) over vision, anticipation, and prevention. This is not the first times that symptoms of cultural myopia have been diagnosed, nor is it the first time explanations have been rendered. The Dutch social historian, Fred Polack, noted in a classic text that, "for the first time in three thousand years of Western civilization there has been a massive loss in capacity, or even will, for renewal of images of the future. Johan Galtung, in his ten-nation comparative study on future images, concluded "...that the tendency to think, or at least to express thoughts, about the future does not seem well developed, it is mainly located in the direction of technological futures and war/peace problems, not in the direction of social futures."

Cultural observers such as Polack and Galtung also discovered something potentially more significant than the decline of future consciousness - the virtual disappearance of utopian thinking as a valid and valued social enterprise. History tells us this may be a profound loss. Again and again, we have been reminded of the role of the utopian mentality in preparing blueprints for the future and the importance of utopias as tools of social critique and analysis. This point was clearly made by Lewis Mumford when he noted that, "A map of the world that does not include Utopia is not even worth glancing at." By avoiding the development of future-oriented, reality-transcending ideas we fundamentally diminish our capacity for effective strategy formation and societal transformation.

All this would not be so disconcerting, or alarming, if it were not for the truth in Kenneth Boulding's observation that images of the future are the keys to choice-oriented behavior. Our inability, or unwillingness, to construct such images fundamentally undermines our capacity as an evolving species to anticipate and adapt to change. The Club of Rome has again challenged policy-making organizations to "...visualize the sort of world we would like to live in, to evaluate the resources - material, human and moral - to make our vision realistic and sustainable, and then to mobilize the human energy and political will to forge the new global society." A recent study by the World Resources Institute and U.S. Environmental Protection Agency has highlighted the urgent need to "create a national vision of an environmentally sustainable future." Will we respond to these challenges?

WHAT KIND OF VISION?

To meet such challenges we must begin to create positive visions of the future, not just new and increasingly sophisticated risk analysis methods. Science may support this

quest for new images of the future, but it will not supply the answers. Central to this challenge is understanding what we mean by vision. To explore this concept, we will use a very broad definition of the term adapted by Thomas Sowell to refer to those ideas or beliefs which "shape thought or action."

1. Pre-analytical cognitive act

The first, and possibly the most valuable, form of vision is what has been termed a "pre-analytical cognitive act." It is precisely this type of vision which can jump the boundaries of the present, the constraints of the past, and shackles of our cultural and social dogmas. This vision eschews analysis and revels in the gestalt switch. Jonathan Swift once described this type of vision as, "the ability to see things invisible." Kuhn speaks of the "flashes of intuition through which a new paradigm is born." Psychological research on the nature of insight points to a variety of precursors and antecedents for this type of vision, including: tolerance for ambiguity, ability to think across disciplines, playfulness, curiosity, and intrinsic and extrinsic motivation. Unfortunately, most of these qualities are undervalued or repressed in large organizations, including our schools and universities. The facilitation of such vision is unlikely to occur without a fundamental reexamination of our ideas concerning what constitutes intellectual, organizational, and social achievement.

2. Unarticulated consensual pact

There is another type of vision, far more prevalent and often insidious, which impacts the everyday behavior of society. This vision is often disguised by covert rules which govern organizational behavior and is embedded in the unvoiced cultural agreements about the nature of causation, social progress, social decline, and constraints. Such belief systems affect human behavior, scientific inquiry, and problem solving without being articulated and without decision makers being aware of their existence. They function precisely because they go unchallenged and unvoiced, seemingly immune to criticism, shaping our thoughts and actions. It is often only through insight and renunciation that people, organizations, or cultures free themselves from the grip of such visions, as these examples illustrate:

My party education had equipped my mind with such elaborate shock-absorbing buffers and elastic defenses that everything seen and heard became automatically transformed to fit a preconceived pattern (Arthur Koestler).

The system of theories which Freud has gradually developed is so consistent that when one is once entrenched in them it is difficult to make observations unbiased by his way of thinking (Karen Horney).

In the final analysis, it may be such grand political or intellectual visions which are the most flawed, the most prone to eventual collapse, the most internally destructive. The inability of institutions to extricate themselves from the grips of such visions is often due to an overdependence on an institutional learning paradigm which some have described as "single-loop learning" where organizational members focus energy

on the detection and corrections of errors so as to maintain the central features of the organizational belief system.

3. Constructed consensus

The third, and final form of vision, which we can call a "constructed consensus" or "intentional shared vision", involves a socially-mediated attempt to challenge the underlying assumptions driving our everyday thinking and create viable alternatives which are truly embraced by all members of a group. Work done with imaging techniques indicates that individuals can create visions of a world which are radically different than the one they know - worlds which are more harmonious, more egalitarian, less stressful, environmentally sound, and peaceful.

Shared visions emerge from individual visions, from which they derive their power and capacity to attract commitment. Organizations or societies which value vision will encourage members to develop and share personal views of the future. Such organizations will also encourage decisionmakers to expose, communicate, test, and modify their mental models of the present, and visions of the future, to allow an ongoing examination of strategies, objectives, and policies. It is important to point out that this type of vision rarely emerges from the board room, management retreat, or the annual planning ritual which inevitably use the past as a starting point for incremental, reactive thinking about the future.

For shared visions to succeed, people must believe that they can shape the future. Unfortunately, such beliefs are seldom reinforced in large institutions where a present-centered, crisis mentality combines with non-systemic thinking to limit both the existence and breadth of vision. As organizational learning expert Peter Senge has pointed out, "...the discipline of building shared vision lacks a critical underpinning if practiced without systems thinking. Vision paints the picture of what we want to create. Systems thinking reveals how we have created what we currently have."

The differences between these three types of vision can be illustrated using a parable told by John Amos Comenius concerning the pilgrimage of a priest. At the beginning of his journey, the priest is fitted with glasses which make all relations and events appear as they are purported to be by the representatives of the age (Vision 2). Later, as the journey progresses, the priest manages to peer around the glasses and realizes that other interpretations of the world are possible and desirable (Vision 3). Finally, at journey's end, he is fitted with a new set of glasses which allow him to see other worlds, utopian worlds, completely different from anything he had imagined (Vision 1).

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The task before us is much like that of the priest, to peer around the glasses or don new glasses - to use vision as a way of (re)organizing our knowledge, values, and social policies. Let us then imagine a comparative risk project driven by vision. The process outlined is tentative and is presented as a challenge rather than a solution. As a sketch, it can only begin to draw on the experiences and literature at our disposal. Four stages are envisioned, which are briefly described below and in the

accompanying diagram:

1. Create a number of images/visions of the future.

When one begins this exercise, it may be advisable to avoid a single vision. There are political and intellectual reasons for avoiding a normative approach with a single endpoint: (1) reaching consensus on one desirable future among many stakeholders in a pluralistic society is often impossible, or at least, extremely time consuming; (2) the existence of a single endpoint makes the exercise vulnerable to attack; (3) single endpoint definition is difficult - tightly defined endpoints often limit creative thinking concerning alternative development paths, while endpoints which are too open are likely to generate too many alternatives.

Realizing that there is no single "right" vision, an attempt should be made to develop, balance, and clearly articulate visions along various dimensions such as: optimistic, pessimistic, business-as-usual, and romantic/utopian. Achieving such a balance requires considerable attention to the structure of the visioning exercise and its participants. A primary requirement is the dedication of a true multidisciplinary group to the project. Securing broad public participation is another key and may require going beyond face-to-face meetings and exploiting information technologies to help support the creation and acceptance of specific visions.

The beginning foundations for such studies may be past visioning exercises which can be reexamined, updated, and expanded. At this point in time, 29 states within the U.S. have completed such studies, along with a number of cities and regions. The usefulness of such past studies may vary significantly depending on the extent of participation in their creation, relevance to existing social and political conditions, and degree of balance. Some states, such as Hawaii, Minnesota, Washington, Colorado, and Maine, have completed long-term visioning exercises and are presently implementing comparative risk projects, offering some unique opportunities to blend risk and vision.

It is crucial that these visions must be carefully crafted and presented. The ability of stories and parables to infect the human imagination and bring about environmental action has been clearly illustrated by such works as Rachel Carson's *Silent Spring* or Garrett Hardin's "The Tragedy of the Commons." We must become storytellers to produce and communicate socially-contagious visions. As storytellers, we need a language which is rich in metaphor and analogy (and devoid of jargon) to communicate intelligible visions which invite comment, participation, and political commitment. The stories which we link to these visions should clearly articulate the crucial events and decisions which occurred during their unfolding, becoming histories of the future which reach back and connect to our shared past.

2. Relate images to risks

The next step, which is conceptual rather than operational, is realizing that each vision is linked to future risks through a causal network of risk sources and exposure pathways. The

source-pathway-problem relationships can be shown in a two-dimensional matrix (see diagram). The vertical axis shows routes of exposure. The horizontal axis lists the sources of chemical and other pollutants which are transported by various processes to biological receptors. Most environmental problems, the typical targets of environmental concern and policy, can be found at the intersection of these two axes.

Interestingly, the risk sources shown on the horizontal axis correspond to many of our primary economic activities. By changing socioeconomic development paths, i.e., adapting new energy policies, transportation approaches, industrial processes, etc. we will alter the nature of the risks emanating from these sources. By understanding what futures are likely, or desirable, the characteristics of the risk sources can be explored. More importantly, this exploration can take place using a language which addresses important questions concerning needs for food, energy, transportation, shelter, commercial products, natural resources, and land.

3. Characterize visions using risk sources

Understanding the potential causal linkages between alternative development paths and risk allows a more precise characterization of the risk sources to take place. This characterization may be conjectural (developed by informed groups and educated guesses), or it may draw on quantitative projections which already exist concerning potential energy consumption, land-use patterns, solid waste generation, resource extraction levels, probabilities of accidental releases, etc. In some cases, past visioning exercises may have defined critical junctures and shifts in socioeconomic development without necessarily examining the associated environmental implications ("hard" vs. "soft" energy paths, low- vs. high-impact agriculture, auto-based vs. mass transit, etc.).

During this step, one can also add information on receptor populations. For instance, how are human populations expected to grow, stratify, age, and migrate during the time period under consideration or how might the numbers and distribution of vulnerable species change? Throughout this stage, the goal is not quantitative precision, but the creation of context and common understanding for further comparison of the alternative endpoints. This includes the articulation of assumptions underlying development paths, and a clarification of uncertainties and cross-impacts between different future events and decisions.

4. Rank alternatives

The next step involves a ranking of the alternative development paths and utilizes a methodology developed at the International Institute for Applied Systems Analysis (IIASA) in Austria for the European Community. During this step, the impacts of our hypothesized futures on various environmental problem areas are compared using an ordinal ranking system.

The ranking factors used are: problem intensity (severity per unit of human or sensitive biotic population), extent (geographic scale), early warning (can the problem be detected with enough lead time for social responses to be effective?),

uncertainty, available technologies (can existing technologies solve or ameliorate the problem?), cost (how expensive is it to manage the risk to tolerable levels?), social/political acceptability (are there social or political barriers to dealing with the problem?), environmental response time (if we act, how long will it take the environment to recover?), and social adaptability (if the problem cannot be forestalled or cured, are we willing to adapt?). Many of these factors, such as the availability of early warning indicators and technologies, are directly related to the preventability of future problems and can be used to identify the pollution prevention potential implicit in different development paths.

By making avoided risks and potential trade-offs explicit, this exercise can lead participants to converge on a desired endpoint (if this has not already occurred). A number of other useful exercises might then be undertaken, including an analysis of barriers (what keeps us from reaching specific endpoints?), an examination of levers (how can we facilitate and accelerate change in certain directions?), a discussion of institutional and social challenges (what can we do?), and an examination of the social values which underlie a particular development path. This exercise can also underpin the development of an implementation plan (with cost estimates) focused on necessary short-term steps down the longer path. Again, the goal is to encourage participation, visionary speculation, and reflection within a framework which can conceptually link future choices with risks.

POSTSCRIPT

The process described in this paper is not science but a blending of art and science, commitment and conjecture. The French poet Jean Girardoux once made the point that the elite often watch catastrophes from their balconies. Risk analysis has often operated from the balcony of erudition, engaging in vacuous monologues with little-understood publics who are surrounded by real and imagined threats. Futurists, for their part, have often been as prone to lapses of irrelevance and the tyranny of pundits. It may now be time to abandon lofty positions and engage in direct discourse over possibilities for the future - to seek and create new visions.

The opinions expressed in this paper are the authors. Full version with references and illu

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