



INEEL/CON-01-00340  
PREPRINT

## **Building Safer Communities: The Integrated Community Safety Approach**

**Rick L. Fawcett  
Thomas A. Kerr  
Steven A. Jordan**

**March 6, 2001**

**Transportation Emergency Preparedness  
Program Combined Regional Seminar**

*This is a preprint of a paper intended for publication in a journal or proceedings. Since changes may be made before publication, this preprint should not be cited or reproduced without permission of the author.*

*This document was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, or any of their employees, makes any warranty, expressed or implied, or assumes any legal liability or responsibility for any third party's use, or the results of such use, of any information, apparatus, product or process disclosed in this report, or represents that its use by such third party would not infringe privately owned rights. The views expressed in this paper are not necessarily those of the U.S. Government or the sponsoring agency.*

# **Building Safer Communities:**

## ***The Integrated Community Safety Approach***

Rick L. Fawcett  
Thomas A. Kerr  
Steven A. Jordan

Idaho National Engineering and Environmental Laboratory  
Idaho Falls, Idaho

February 27, 2001

### **ABSTRACT**

This paper discusses an integrated community safety approach to creating safer communities. It defines community broadly to include two categories of community members: “industry” and “neighbors.” Potential community members within the “industry” category include facilities, government/regulators, customers, stockholders, and suppliers. Within the “neighbors” category are towns, cities, counties, states; people/commodity flow systems; news media and special interest groups; environment; and families of employees. Each of these potential community members and its characteristics are discussed.

The integrated community safety approach consists of three major activities: (1) define the boundaries of the community; (2) facilitate the *sense of community*; and (3) address the needs of the community. Defining the boundaries of the community includes determining the geographical and social boundaries; this is accomplished through conducting a hazard analysis and community involvement to identify all of the community members. Facilitating the *sense of community* includes conducting a capability/needs assessment and continuing community involvement to identify the issues and concerns of community members. Addressing the needs of the community involves master planning to consider safety issues in all community development actions and continuing community education and involvement.

The integrated community safety approach is a workable approach for existing industries and their neighbors as well as new projects that industries and their neighbors might be considering. By using this socio-technical approach to integrating industry and all of its neighbors into a safer community, the integrated community safety approach will better assure the viability and safety of industry and its neighbors while maintaining or improving the overall quality of life.

# **Building Safer Communities:**

## ***The Integrated Community Safety Approach***

### **Introduction**

When returning from your workplace, when do you feel like you are home? It is almost certainly not when you actually enter your property. It could be when you cross a certain street, make a particular turn, or pass a unique landmark, but chances are you are still a long way from your house. It is the point at which you begin to relax and think, “I’m home.” That is what we call your *sense of home*.

Similarly, when returning from a long automobile trip, when do you feel like you are in your community? It is almost certainly not when you are within the physical community limits. It may be when you cross a certain bridge, pass a particular building, or sight a familiar mountain. And again, you are likely to still be some distance outside your actual community. It is the point at which you begin to relax and think, “I’m back.” That is what we call your *sense of community*.

Each community, in turn, has a *sense of community*. Although industries have improved in recent years, examples still abound of industries unknowingly violating this sense of community. Bhopal, Chernobyl, and Exxon Valdez all bring to mind vivid past violations of the sense of community. In each case, industry was unable or unwilling to communicate effectively, accurately, or in a timely fashion. And the community was larger than ever imagined in any of their planning.

What is true for existing industries is also true for new projects. We all know of proposed controversial facilities or projects such as landfills, hazardous waste incinerators, pipelines, or transmission corridors, to name just a few, that have inadvertently violated that sense of community—and never came to be as a result.

But it does not have to be that way. For industry and its neighbors to work together to form safer communities, this sense of community must be recognized and respected. In some cases it must even be established with community members that are unaware of their involvement. An approach that integrates social techniques and new technologies—an *integrated community safety approach*—will better assist industry and its neighbors to mold themselves into a more cohesive community, a safer community. This paper outlines such an approach.

# Overview of the Integrated Community Safety Approach

The integrated community safety approach necessarily uses a broad definition for “community.” For this approach, we define “community” as the geographical and social context of a related group of interests or members. In this sense, the “community” could be far-flung. The “community” cannot stop at arbitrary political boundaries because emergencies respect no such boundaries. For some hazards, the “community” may be a transportation corridor or a river channel or maybe even the direction the wind happens to be blowing that day.

In Policy Paradox, Stone<sup>1</sup> draws a distinction between objective and subjective “interests.” Objective interests are those that actually “impinge on people” while subjective interests are those that people only *believe* affect them. Both interests are examples of what we mean when we say “community.”

In Spirit of Community, Etzioni<sup>2</sup> sees community as something more than a shared place or interest: “...communities are best viewed as if they were Chinese nesting boxes, in which less encompassing communities (families, neighborhoods) are nestled within more encompassing ones (local villages and towns), which in turn are situated in more encompassing communities, the national and cross-national ones.” Again, this is a sense of what we mean by “community.”

Figure 1 is a visual depiction of our “community.” Each of the boxes and circles represents potential community members that will be assessed during the integrated community safety approach. Once each of the potential community characteristics is discussed, we will discuss in detail how we accomplish the three major activities of the integrated community safety approach: (1) define the boundaries of the community; (2) facilitate the sense of community; and (3) address the needs of the community.

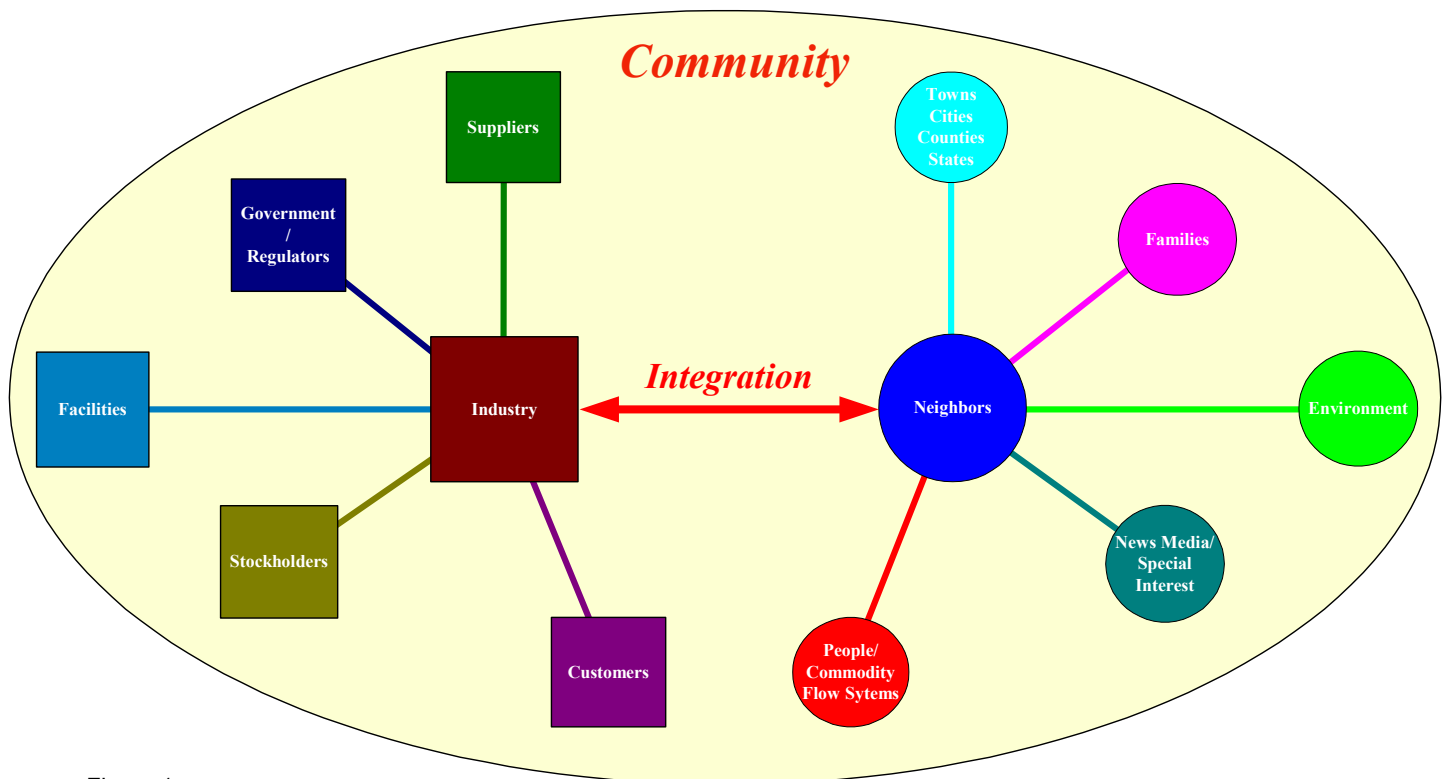


Figure 1

## **Community Characteristics**

As pictured in Figure 1, we have indicated that potential community members can generally be classified into two broad groups: *industry* and *neighbors*. Of course, each community will have different members and those members will be more or less involved over time depending on their own circumstances. We will discuss each of those broad groups and their characteristic members in the following sections.

### **Industry**

We use the term *industry* as a convenient grouping of specialized community members that are primarily focused on safe business operations. These community members include (1) facilities, (2) customers, (3) stockholders, (4) government and regulators, and (5) suppliers.

#### **Facilities**

The term “facilities” includes all of the buildings, sites, equipment, infrastructure, engineered units, and employees associated with a particular business/industry. In many cases, a business may have several facilities that are widely distanced, but are nevertheless a part of that community.

#### **Customers**

Every business has customers that are concerned with and/or affected by safe operations. As with facilities, customers may be located in many different areas that are not local to the business operations and business products may be used virtually anywhere. Because of continuing liability, customers must be considered an important part of the community.

#### **Stockholders**

We use the term “stockholders” broadly to include all investors in a business whether it is actually in stock or not. Stockholders and investors, of course, are almost immediately affected by anything that affects the business. When safety concerns arise, the changing price of stock reflects the degree of concern and investors will be more difficult to attract and retain. Therefore, stockholders have a fundamental role in the community.

#### **Government and Regulators**

The term “government and regulators” means any governmental agency that has some form of legal or regulatory authority with regards to the business/industry. Examples of federal

regulatory agencies in the United States include the Occupational Safety and Health Administration, the Mining Safety and Health Administration, and the Environmental Protection Agency among many others. Other countries have equivalent agencies and all international industries are subject to a sometimes confusing array of federal, state/provincial, and local regulatory agencies. In addition to regulatory agencies, there are other governmental bodies such as planning and zoning commissions, siting commissions, and tax authorities that may be a part of the community.

## **Suppliers**

Suppliers are often overlooked as part of the community, but they perform an important safety function for industry. Suppliers are best qualified to know how their products perform in different situations and what safety actions should be taken when problems arise. Their businesses are also affected by any safety concerns from their customers so their safety planning should be considered from the outset as a vital part of community safety.

## **Neighbors**

We classify other potential community members that may not normally be perceived to be a vital part of safe business operations into a second broad group called *neighbors*. While some of these community members are obvious, others are less often considered and might be overlooked. However, each is an integral part of the overall community and has a potentially important function for the health of the system. Potential neighbors include (1) towns, cities, counties, and states; (2) the environment; (3) people and commodity flow systems; (4) news media and special interest groups; and (5) families of employees.

## **Towns, Cities, Counties, and States**

This community group includes all of the governmental agencies that may have an interest in the business/industry, but do not have direct regulatory authority over some aspect of operations. Examples in this group might be economic development agencies, road and bridge authorities, and school districts.

## **Environment**

The environment is an area that may not normally be thought of as part of a community, but should be. People may be affected by business operations that adversely affect environmental conditions. For example, residents in downwind areas may be at risk from air releases of smoke or hazardous materials, residents downstream near rivers or within aquifer areas may be affected by subsurface releases from old injection wells or infiltration ponds, or farmers using irrigation may be affected by surface spills into reservoirs or rivers.

## **People/Commodity Flow Systems**

Another area that is often overlooked as being a part of the community is what we call “people/commodity flow systems.” This area includes highways and roads that employees, customers, and suppliers use to access business/industry facilities as well as transportation and transmission corridors for products such as electrical transmission lines, pipelines, and in some cases air or water routes. Some remote business locations provide bus or shuttle transport for employees; these systems would be included in this group as well.

## **News Media and Special Interest Groups**

A special category of community includes news media and special interest groups. News media include local newspapers, television, and radio. News media also include major news markets from cities or other areas that may take an interest when a significant safety issue occurs at a business/industry. Special interest groups include environmental activist groups, local citizens groups, neighborhood associations, or national groups that may seek to focus attention on a business or industry.

## **Families of Employees**

We believe families of employees (who may not all be located locally) constitute a special part of the community that must be considered apart from other community members. Families have special concerns for the safety of employees and will need to be one of the first community groups that business and industry addresses during a time of crisis or safety concerns. When a safety situation occurs, family members are invariably among the first to speak out—they deserve to have the most accurate and timely information available about their loved ones. Conversely, if care for families is not adequately pre-planned in the event of a natural disaster or other catastrophe, then community members cannot assume that employees, whether public safety or industrial, will remain at their assignments—they will be likely to try to ensure the safety of their own families first.

## **Three Steps to Integrating Community Safety**

To this point, we have described the spectrum of possible community members that might need to be involved when implementing the integrated community safety approach. To implement that approach, we must employ *social* and *technical* tools to take three important steps: (1) define the boundaries of the community, (2) facilitate the sense of community, and (3) address the needs of the community.

### ***Define the Boundaries of the Community***

A community’s boundaries must be defined in two ways: geographically and socially. The geographical boundaries are determined by conducting a *hazard analysis*. Fawcett *et al*<sup>3</sup> state

that a “hazard analysis is a three-step decision-making process used to identify potential hazards within a community.” They go on to explain that a hazard analysis includes *hazard identification*, *vulnerability analysis*, and *risk analysis*:

*Hazard identification* provides specific information concerning situations that have the potential to cause injury or damage to property and the environment. Hazard identification includes human-caused incidents such as fire and hazardous materials spills as well as natural disasters such as floods and earthquakes.

A *vulnerability analysis* identifies areas in the community that may be affected or exposed, individuals in the community who may be subject to injury or death from certain specific hazards, and what facilities, property, or environment may be susceptible to damages should an emergency event occur.

A *risk analysis* is an assessment of the probability of an accident and the actual consequences that might occur based on the estimated vulnerable zones. Risk analysis involves a judgement of incident probability and the severity of potential consequences based on previous incidents, experience, and the best available current technological information.<sup>4</sup>

The second dimension of defining a community’s boundaries is the social one. Each of the community characteristics depicted in Figure 1 must be carefully considered—each may represent a significant set of stakeholders. Beginning early in this step, meaningful community involvement will help to define the social boundaries of the community. The key element at this point is to identify all of the possible stakeholders. Accomplishing this key element will involve actively seeking out and identifying stakeholders. Fawcett and Kramer<sup>5</sup> explain that among others this includes referencing historical stakeholder sets, monitoring and analysis of news media reports, monitoring and analysis of public meeting involvement, identifying appropriate elected and appointed officials, identifying agencies and organizations with related, legally mandated responsibilities, and identifying persons or organizations with vested interests.

## ***Facilitate the Sense of Community***

Once the geographical and social boundaries of the community have been determined, the next step in the integrated community safety approach is to facilitate the *sense of community*. Many community members may not be actively aware that they are in this special community. Facilitating the sense of community helps all of the appropriate members to come to understand that they are a part of this community and that it is to their advantage to actively participate in ensuring its safety. This step requires two activities: (1) conducting a capability/needs assessment and (2) continuing community involvement.

Fawcett *et al* explain what it takes to conduct a capability/needs assessment in detail.<sup>6</sup> Major activities of this process include determining the current and projected demographic profile of



the community, investigating equipment and manpower needs for the current system and anticipated growth, assessing communication systems, reviewing current planning documents, evaluating training and education levels for those involved in community safety activities, and evaluating the safety management structure and infrastructure. Conducting and documenting this assessment is an exhaustive process aimed at determining the current level of safety preparedness and trying to anticipate future needs.

The community involvement aspect of facilitating the sense of community is a seamless continuation of the community involvement process begun when defining the boundaries of the community. Two key goals of the community involvement process for this step are to identify and document stakeholders' roles and responsibilities and determine stakeholder issues and expectations. To accomplish this step requires researching/analyzing many sources of information to determine and document what the public and stakeholders expect. Sources of information such as those cited by Fawcett and Kramer and discussed in the previous section should be analyzed. From this research and analysis, the integrated community safety approach identifies important issues and reduces the issues to a set of what Fawcett and Kramer call "derived requirements."<sup>7</sup> "Derived requirements" are technical requirements that are derived from stakeholder requirements and stated in clear, unambiguous, and measurable terms. These derived technical requirements are then verifiable and directly traceable to the technical problem to be solved.<sup>8</sup> Developing technical requirements should be done with great care, however, since "...factual and technological issues should be separated from value issues. In general, technological problems are more tractable than conflicts of values. This is because technological problems at least may be solvable in principle, that is scientifically possible, while clashes of values could remain unresolvable. It is also pointless, and a waste of resources, to pursue technological solutions to a problem that stems from conflicts of values."<sup>9</sup> Throughout the lifetime of a project, this level of community involvement must be maintained because "knowledge and values are both dynamic, so no permanent solution should be expected."<sup>10</sup>

By conducting a thorough capability/needs assessment and continuing community involvement, the community should begin to gain a clearer picture of who its members are and why it is a community; it should begin to recognize and embrace its *sense of community*.

## ***Address the Needs of the Community***

Once the capability/needs assessment is complete, the next step is to address those identified needs and augment capabilities. The process we use to do this is through *master planning*—again with full community involvement throughout the process. The master planning process incorporates findings and recommendations for improvement, alternative solutions to identified needs, and comprehensive consideration of community safety issues into a plan for continuing community development. What this means is that any activity that the community as a whole or one of its members undertakes will give full consideration to community safety issues. For example:

- When planning and zoning a new industrial park, transportation routes will be assessed to determine whether they pass schools, hospitals, nursing homes, or other potentially vulnerable populations

- If an industry proposes a new pipeline through a portion of the community, its route will be assessed from a safety standpoint to determine potential impacts on traffic patterns, resources such as wetlands, or significant cultural sites
- If a new housing development is proposed, it will be examined to determine what additional safety systems will be needed in order to adequately respond to potential emergencies or what effect its addition will have on current response times for police and fire service.

Developing a master plan is an iterative process because it is a living document. As a community changes and grows over time, the safety issues that need to be confronted will change. It is best to think of the master plan as an ongoing *process* that is never really finished.

With community involvement, it is likely that the master planning process will have some level of recognition in the community-at-large, but it is likely that the level of awareness will need to be increased. This is necessary for two reasons: to ensure that the community is aware of safety issues and the plans to address them and to serve as a feedback mechanism to improve the planning efforts and process. Community members that are interested in safety issues will be more involved from the start of the process than others, but the community-at-large can provide valuable insight on the completeness, correctness, and fairness of the process. Increasing the level of awareness and soliciting additional feedback is done through *community education*. Community education is a two-way communication process that should help to improve the planning process.

Other activities in addressing the needs of the community are ensuring that all of the appropriate personnel are adequately trained and equipped to perform their safety functions and that the safety planning and preparedness are verified. Verification involves actually testing the system through the use of safety exercises and drills and ensuring that any improvements or lessons learned get incorporated into the master planning process.

It is also in this step that new technologies can be brought to bear to increase community safety and address community needs. New equipment such as robotics may be appropriate if dealing with environments hostile to human beings. New visualization techniques may be useful to understanding how a safety situation is progressing. New modeling and mapping techniques may be helpful to understanding how surface or belowground activities are affecting subsurface features such as aquifers. New communications systems can help to ensure the availability of more accurate and timely information. Even the planning process and documentation can be prepared to be interactive and used on a regular basis rather than being relegated to a dusty set of binders that sit unused on someone's shelf. New technologies, however, must not be tried simply because they are new. Integrating new technologies that are appropriate to the special nature of the community is one of the key challenges of the integrated community safety approach. The application of any new technology intended to address a need must be carefully considered within the larger context of the community and the social, cultural, and political underpinnings for any new technology or technique must be assessed and maintained.

At this point in the integrated community safety approach, the community should know who its members are and what their needs are. It should have a well-developed sense of community and it should have a master plan and process to ensure that safety issues are continually incorporated into community plans and actions. In short, it should have an integrated community safety program.

## Conclusion

Our safety and health culture has changed much in the last thirty years. From the “industry” standpoint, there has been a marked increase in safety efforts, a growth of zero tolerance for accidents, and an increased desire for maximizing value and minimizing risk while delivering more products and services. From the “neighbors” standpoint, there has been an increased public environmental awareness, a decreasing tolerance for risk, and an increased desire to receive greater value from more and safer products and services. In the case of industry, part of the motive is increasing profit while in the case of the neighbors the motive is raising the standard of living. What industry and its neighbors hold as a common value is a desire to achieve all of their individual values while maintaining or improving the overall quality of life.

Over the same thirty years, we have seen a tremendous leap forward in thousands of technologies. We can now remain in constant communication anywhere, anytime; we can pinpoint locations of people and equipment to within one meter; we can track contaminants as they move through our environment; we can send robots into hostile environments; and we can draw from diverse databases to gain a greater understanding of “the big picture.”

Although we have all of these technologies at our fingertips, what we have *not* seen is an integrated *socio-technical* approach to community safety that injects a full spectrum of advanced technologies while remaining sensitive to the entire array of social, political, and cultural issues. Until now, we have not seen the deliberate integration of industry and its neighbors into a *community*—and instilling that *sense of community* is the essence of the integrated community safety approach. The integrated community safety approach is not only appropriate for existing communities, industries, and facilities, but is also an effective approach *before* a project begins. It is applicable to siting, licensing/permitting, and developing practically any new community or industry infrastructure such as transmission corridors, roads, and controversial facilities.

By using a socio-technical approach to integrating industry and all of its neighbors into a safer community, the integrated community safety approach will better assure the viability and safety of industry and its neighbors while maintaining or improving the overall quality of life.

---

<sup>1</sup> Stone, Deborah, Policy Paradox: The Art of Political Decision Making, W. W. Norton & Co., New York, New York, 1996

<sup>2</sup> Etzioni, Amitai, Spirit of Community: Rights, Responsibilities, and the Communitarian Agenda, Crown Publishers, Inc. New York, New York, 1993

<sup>3</sup> Fawcett, Rick, Bryan Parker, George Kramer, Ph.D., Steve Jordan, "Building a Self-Sustaining Public Safety Program: The Socio-Technical Integration Approach," Idaho National Engineering and Environmental Laboratory, Idaho Falls, Idaho, November 2000

<sup>4</sup> Ibid., p. 6.

<sup>5</sup> Fawcett, Rick and George Kramer, Ph.D., "The Excess Perfection Syndrome II: What Happens with Unnecessary Requirements," Waste Management '99, Tucson, Arizona, March 3-4, 1999

<sup>6</sup> Op cit., Reference 3, pp. 6-8

<sup>7</sup> Op cit., Reference 5

<sup>8</sup> Martin, James N., Systems Engineering Guidebook, A Process for Developing Systems and Products, CRC Press, 1997, p. 19

<sup>9</sup> Edwards, Marc, "Prospects for the Future of Radiation Use and Protection," Health Effects of Exposure to Low-Level Ionizing Radiation, Institute of Physics Publishing, Bristol and Philadelphia, 1996, p. 554

<sup>10</sup> Ibid., p. 554