♻EPA United States
Environmental Protection
Agency

Considerations in
Risk Communication

A Digest of Risk
Communication as a
Risk Management Tool

Foreword

The U.S. Environmental Protection Agency (EPA) is charged by Congress with protecting the Nation's land, air, and water resources. Under a mandate of national environmental laws, the Agency strives to formulate and implement actions leading to a compatible balance between human activities and the ability of natural systems to support and nurture life. To meet this mandate, EPA's research program is providing data and technical support for solving environmental problems today and building a science knowledge base necessary to manage our ecological resources wisely, understand how pollutants affect our health, and prevent or reduce environmental risks in the future.

The National Risk Management Research Laboratory (NRMRL) is the Agency's center for investigation of technological and management approaches for preventing and reducing risks from pollution that threaten human health and the environment. The focus of the Laboratory's research program is on methods and their cost-effectiveness for prevention and control of pollution to air, land, water, and subsurface resources; protection of water quality in public water systems; remediation of contaminated sites, sediments and ground water; prevention and control of indoor air pollution; and restoration of ecosystems. NRMRL collaborates with both public and private sector partners to foster technologies that reduce the cost of compliance and to anticipate emerging problems. NRMRL's research provides solutions to environmental problems by: developing and promoting technologies that protect and improve the environment; advancing scientific and engineering information to support regulatory and policy decisions; and providing the technical support and information transfer to ensure implementation of environmental regulations and strategies at the national, state, and community levels.

This publication has been produced as part of the Laboratory's strategic long-term research plan. It is published and made available by EPA's Office of Research and Development to assist the user community and to link researchers with their clients.

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About This Digest

This communication digest describes how risk communication tools can be developed to help manage an environmental risk to a community. The tools are key components of effective risk communication programs. These tools can be used by public health departments, county governments, local environmental organizations, and other agencies faced with possible environmental or health risks to a community. This document outlines some planning and implementation steps to consider when communicating risks to the public. Tools and techniques developed for successful environmental risk communication are also discussed, along with details on collaborative decision making and how it relates to risk communication.

The U.S. Environmental Protection Agency (EPA) places a strong value on effectively communicating environmental risks to the public, and has developed programs emphasizing risk communication. The EPA's Environmental Monitoring for Public Access and Community Tracking (EMPACT) program was established to demonstrate new monitoring and communication technologies that make it possible to provide environmental information to the public in near real-time. This program worked with the 86 largest metropolitan areas of the U.S. to help communities collect, manage and distribute time-relevant information, and provide residents with easy-to-understand information they could use in making informed, day-to-day decisions. Specific case studies on new technologies developed through the EMPACT program are cited in the "Risk Communication in Action: Case Studies" section of this digest.

Introduction to Risk Communication

Risk Communication is the process of informing people about hazards to their environment or their health. Communicating risk is a two-way exchange in which organizations inform target audiences of possible risks, and gather information from those affected by the risk.

Risk communication is a critical step in effectively defining and managing any crisis situation. Communicating a message with specific instructions and alternatives regarding a health or environmental risk to a community can lead to successful risk management of a crisis.

Appropriate risk communication tools will communicate to the public the magnitude of the risks involved in a particular situation and lay the groundwork for the trust that needs to be established between the community and the agency dealing with the risks involved.

In many cases, risk communication is a parallel approach to traditional risk management. For example, while efforts are underway to reduce mercury levels in the air that pollute lakes and streams, risk communication to reduce human consumption of affected fish populations can help reduce overall risk at a faster rate.

For many environmental risks, such as skin cancer caused by solar ultraviolet radiation, or mercury poisoning from contaminated fish, the challenge is to get people to participate in their own risk management by taking personal precautions. However, most people tend to make wise decisions about risk and ways to avoid it when they are given information they understand and can use in their everyday lives.

In the 21st Century, the public is becoming more concerned with its environment, human health and safety. Citizens want answers to questions such as:

- How safe is the water we drink?
- How polluted is the air we breathe?
- Is it dangerous to be outside?
- What risk does the landfill down the street pose to my family and my community?

When a community is faced with an environmental or human health risk such as a chemical spill, or a "boil water" emergency, it is essential for local and state environmental agencies and health departments to

have a plan of action in place. Being able to communicate with the public in a prepared and organized way can allow a potentially chaotic situation to remain under control until there is no longer a threat. This guide is intended as a reference to help proper authorities take specific steps during a crisis situation to successfully communicate and manage environmental risk.

Basic Risk Communication Elements

Communication experts generally agree that there are three main elements to focus on when communicating an environmental risk:

- Message
- Medium
- Audience

Message

Messages are the overall information an agency wants its audience to walk away with, even if it forgets the details.

A message is usually phrased as a brief (often one-sentence) statement. An example of this would be, "The ozone map provides you with real-time information about ozone levels in your community."

When sending a message, two main objectives are to inform and persuade. A good way to help an audience understand a message and be persuaded to take a certain action is by taking it through the four phases of knowledge: awareness, understanding, decision, and implementation. In the awareness phase, messages should be short, catchy, and just barely informational. Messages such as "Think Green" fall into this group. Messages intended to reach the understanding level usually deliver more information such as "Cigarette smokers are 12 times more likely to die of lung cancer than non-smokers." Decision-making messages often compare options such as choosing the best time of day to fill gas tanks during a smog alert. Messages intended to help people implement some action are often crisis related. An example of this would be a "boil water" advisory during a drinking water emergency.

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Medium

The medium for the message, whether it is the internet, a brochure, a refrigerator magnet, or some other form of communication, has specific properties. For example, billboards are best for brief messages, brochures for complex information, television for moving images, and radio for specific target audiences. Cost is also a factor; generally the broader the outreach, the higher the cost. The choice of medium can be very important to the successful transmission and reception of the message.

Medium selection is also related to the type of message an agency is sending. For example, refrigerator magnets work well for short messages at the awareness level, but don't contain space for the understanding level of communication. Brochures present information at the understanding level, but unless people have already been reached at the awareness level, they won't devote the time to read them.

Audience

The target audience for the message is a key consideration. Target audiences for a water quality outreach program might include, for example, the general public, local decision makers and land management agencies, educators and students (high school and college), and special interest groups (e.g., homeowner associations, fishing and boating organizations, gardening clubs, lawn maintenance/landscape professionals).

Risk may vary dramatically in different populations. Subpopulations have different risks when exposed to the same concentration of a pollutant. It is imperative to the risk communication process that the makeup of a community and its cultural diversity be studied and matched to the appropriate message and medium. Persons of lower socioeconomic means probably will not be effectively served by messages delivered via the internet. For this particular audience, television and radio messages may be more suitable.

Successful risk communicators must also know how the public perceives risk. When researching audience dynamics, it is important to distinguish between objective and subjective risk. Objective risk is calculated by scientists based on research. Subjective risk is the risk that the public perceives to be hazardous. It is affected by issues of familiarity, dread, fairness, avoidability, and personal control.

Suggestions for Collaborative Decision Making When Communicating Environmental Risk

Communicating with diverse audiences can be challenging, both because of the difficulty of translating scientific information to nonscientists, and also because of the differences in priorities. These differences in priorities are illuminated by understanding the differences between objective and subjective risk, and are bridged by several tools and techniques including collaborative decision making.

By incorporating other environmental experts into the decision making process, agencies can thoroughly assess and manage environmental and human health risks. Some basic rules have been developed by Covello and Allen[1] for collaborative decision making with regard to risk communication:

1. **Accept and involve the public as a partner.** An agency's goal is to produce an informed public. When thoroughly and adequately informed, the public can often play a key role in creating excellent ideas for helping its own communities. Because different cultures have different risk perceptions, it is important to have a representative of each affected com munity involved in the risk communication process.

2. **Plan carefully and evaluate your efforts.** A plan of action for situations that can pose significant health risks to the public and risks to the environment should be in place ahead of time. Develop ways to evaluate how effectively you have communicated your message to the public.

3. **Listen to the specific concerns of community members.** People often care more about trust, credibil ity, competence, fairness, and empathy than about statistics and details. It is an agency's job to protect communities by communicating appropriate information and conveying an action plan if necessary. In order to be able to make an accurate diagnosis of the problem, an organization must first listen.

4. **Be honest, frank, and open.** Trust and credibility are difficult to obtain; once lost they are almost impossible to regain.

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The public will have more respect for you and your agency if you are straightforward and honest.

5. **Work with other credible sources.**
Conflicts and disagreements among organizations make communication with the public much more difficult. When dealing with a crisis situation, bring in the appropriate experts, such as scientists or public health officials, to answer question or make recommendations to a concerned public about the best way to handle the situation.

6. **Meet the needs of the media.**
The media usually prefer simple facts. Think of their perspectives; know their dead lines and policies. When talking with news reporters, be specific about the risk. Do not make assumptions or give possible out-comes. Messages can be misinterpreted, which can create a panic situation with information that is not solid and factual. Be prepared ahead of time to have your information and facts in order. Be clear and to the point.

7. **Speak clearly and with compassion.**
When you are dealing with a health threat or an environmental risk, you must be prepared to show compassion. This is a time when the community will need understanding. Let community members know that you will work with them as a partner and will keep them informed as things happen.

In order to more deeply understand communities and their needs, it is important to incorporate risk perception into the definition of risk. The EPA's Office of Air and Radiation[2] considers some attributes that may affect a person's perception of a risk:

- How serious and dreaded is the illness?
- How certain is scientific knowledge?
- What is the catastrophic potential?
- Who bears the risk?
- Is the risk voluntary?
- Who benefits from the "risky" activity?

Risk Communication Tools and Techniques

Risk communication tools focus on helping communities, agencies, and individuals make informed decisions that either minimize negative impacts, or directly improve health and environmental quality. Some examples of public participation tools and techniques for risk communication follow.

Surveys

Surveys conducted on a regular basis for a particular environmental issue or concern will allow citizens to express their concerns and opinions about possible risks that may affect them. Information obtained from surveys often help managers and agencies make appropriate risk management and assessment decisions.

Modeling

Modeling can sometimes be a good surrogate for environmental sampling. In many crises, continuous monitoring can lead to an understanding that allows determination of trends. This can then allow forecasting and warnings.

Indexing Techniques

Indices like an air quality index, a water quality index, or a fish quality index, allow complete scientific information and data collected through monitoring to be translated in a way the public can understand.

Figure 1.[3] "Air Quality Index (AQI)" is an example of how EPA and other organizations make information about outdoor air quality available to the public. The AQI is used as a key tool to provide the public with timely and easy-to-understand information on local air quality and what associated health concerns it should be aware of. The AQI uses a scale of values to indicate the level of health concern and associated color-coded warning.

Air Quality Index (AQI)*

AQI Number	Health Concern	Color Code
0 to 50	Good	Green
51 to 100	Moderate	Yellow
101 to 150	Unhealthy for sensitive groups	Orange
151 to 200	Unhealthy	Red
201 to 300	Very unhealthy	Purple

*Although ozone reports are primarily made for metropolitan areas, ozone can be carried by the wind to rural areas, where it can cause health problems.

Exhibits

Visual displays are an effective way to present information because people can sometimes better understand an idea or concept presented in a visual form.

Internet

The internet is the electronic gateway to an array of multimedia (audio, video, photographic) databases and textual resources for searching and posting information. The internet has powerful, intuitive search technologies that can help agencies find specific information quickly, communicate with the public, and recommend information resources to others.

Maps and Aerial Photographs

Maps and aerial photographs are visual aids that facilitate the communication of complex issues such as contamination and risk factors. They can be used at community involvement activities such as public meetings, and poster sessions.

Figure 2.[3] "Online Dynamic Watershed Atlas (Seminole County, Florida)" is designed to provide citizens, scientists, and planners of the Seminole County region with comprehensive and current water quality, hydrologic and ecological data, as well a library of scientific and educational resources on ecology and management. This online atlas is an example of an online service created to give citizens and scientists easy access to specialized information.
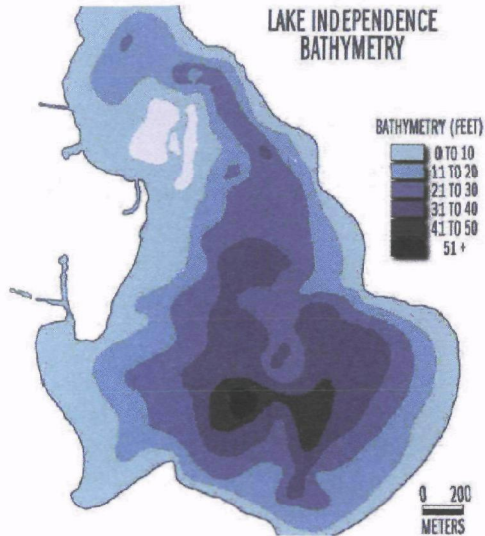
Easy-to-read maps that have been developed through a geographic information system (GIS) are an invaluable source of information for pinpointing particular areas of concern with regard to environmental risk. GIS is a computer-based information technology that incorporates graphical features such as maps and other data in order to assess real-world problems and situations.

Figure 3.[4] "Lake Independence and Lake Minnetonka Watersheds - Lake Access Project" is a color coded map used to distinguish land uses surrounding the lake (e.g., agricultural, residential, commercial, industrial, forest, and wetland). Maps of this type can help inform the public and local officials about connections between local water conditions and current uses in their communities.

Mass Media

In many communities, print and broadcast media play a crucial role in conveying information to the public. The news media provide a principal and speedy means for members of a community to communicate and interact. However, an organization cannot control what the press will cover and how. Newspaper reporters or television cameras usually cover town meetings or press conferences to observe firsthand how the public is reacting to the information they are receiving.

Figure 4.[4] "Lake Independence Bathymetry - Lake Access Project" is an example of a GIS map created to include two-dimensional representations of various lake parameters. In this particular graphic, depth is shown. By using this capability of GIS, agencies can combine different types of data layers to predict how quickly sediments or contaminants might move through a stream system. GIS and other data visualization tools offer better support and communication of observations, conclusions, and recommendations to resource managers, students, regulators, and the public. These groups can then use displays and analyses to help make day-to-day decisions that can affect the quality of their lakes and streams.

Toll-Free Hotline

Establishing toll-free hotlines for information up-dates and community questions can be a very effective tool for promoting public involvement and feedback.

Workshops

Workshops are formal, participatory seminars used to explore a subject, develop or improve public aware-ness and involvement, allow citizens to see firsthand how risks are assessed and managed, or to design a risk communication message. They can be developed as mini-courses on a discrete topic relevant to an af-fected community. A technical expert can be invited to offer an inside perspective and to increase the effec-tiveness of a workshop.

Mailing lists	• Brochures • Newsletters • Fact sheets • Utility bill inserts or stuffers
Phone/fax	• Promotional hotline
E-mail/Internet	• Newsletters • E-mail messages • Web pages • Subscriber list servers
Radio/TV	• Cable TV programs • Public service announcements • Videos • Media interviews • Press conferences/releases
Journals or newsletters	• Newsletters • Editorials • Newspaper and magazine articles
Meetings, community events, or locations (e.g., libraries, schools, marinas, public beaches, tackle shops, etc.) where products are made available.	• Exhibits • Kiosks • Posters • Question-and-answer sheets • Novelty items (e.g., mouse pads, golf tees, buttons, key chains, magnets, bumper stickers, coloring books, frisbees, etc.) • Banners • Briefings • Fairs and festivals • Meetings (i.e., one-on-one and public) • Community days • Speeches • Educational curricula

Table 1.[5] "Methods of Communication" gives additional examples of various distribution avenues and outreach products for effectively communicating environ-mental data to the public.

Designing a Risk Communication Plan

Once the target audience has been identified, an agency should be able to easily identify the desired outcomes. The plan should also include long-term goals for the overall risk communication program and short-term objectives for a specific project. Once the appropriate tools are selected that match the particular environmental or health risk, a timeline and assignment of responsibilities should be put in place. An agency's program is likely to be most effective if a variety of appropriate professionals are involved. Where possible, consider the following:

- A communication specialist or someone who has experience developing and implementing an out reach plan.
- Technical experts in the subject matter (both sci entific and policy).
- Someone who represents the target audience, i.e., the people or groups you want to reach.
- Key individuals who will be involved in imple menting the plan.

Factoring in estimated costs for putting a plan in motion should also be included. Many adjustments may be made throughout the process, but it would be a good idea for an initial plan to have these guidelines and timelines in place.

Following Up

What follow-up mechanisms should an agency establish to obtain feedback? Successful outreach might generate requests for further information or concern about issues that have been raised. It is important for an agency to consider whether and how it will handle this interest. The following questions can help an agency develop this part of its strategy:

- What types of reactions or concerns are audience members likely to have in response to the out reach information?
- Who will handle requests for additional information?
- Does the agency want to indicate on the out reach product where people can go for further information (e.g., provide a contact name, number, address, or establish a hotline)?

Effectiveness Measures

Because of the importance of communicating risk to the public, it is useful to measure how effectively an agency is communicating. Many methods and techniques have been developed to allow an agency to hear firsthand from the public what it does and does not understand to be the risk. Town meetings as well as telephone and mail surveys are some examples of effective ways to obtain feedback from the public regarding understanding and concerns about a potential risk to a community.

Risk Communication in Action: Case Studies

The EPA through the EMPACT program worked with large metropolitan areas to help collect and distribute environmental risk information. This program involved EPA working with different communities to provide residents with easy-to-understand information used in making informative decisions based on environmental issues and health risks.

Here are three examples of risk communication in action.

Air Quality Risk Communication Study

Ozone, at ground level, presents a serious air quality problem in many parts of the U.S. because ozone plays a major role in respiratory health effects. Residents in communities with high ozone levels can use timely risk information to help them take action to reduce local ozone levels.

One of the most successful risk communication projects is the Ozone Mapping Project, which creates maps that provide hourly ozone data taken from monitoring networks in different regions of the country. The maps use color-coded contours to depict the level of health concern associated with different categories of ozone concentration.

In addition, the AIRNOW web site, part of the Ozone Mapping Project, was created by the EPA's Office of Air and Radiation to provide real-time air pollution data in an understandable, visual format; information about public health and environmental effects of air pollution; and information about ways in which the public

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Good
Moderate
Unhealthy for Sensitive Groups
Unhealthy
Very Unhealthy
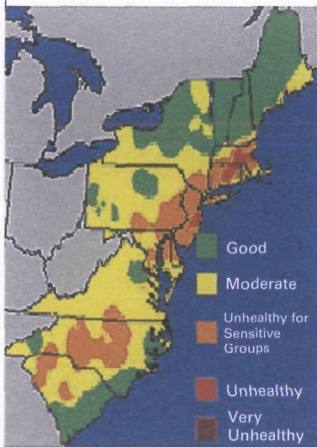
Figure 5.[6] Map taken from the project, " Ozone Monitoring, Mapping and Public Outreach: Delivering Real-Time Ozone Information to Your Community." The map represents ozone values in the northeastern United States on August 24, 1998.

can protect its health and reduce pollution (http://www.epa.gov/airnow). This web site, which is beneficial to people with asthma or other health conditions that relate to ozone and air quality, also offers links to state and local air pollution control agencies with real-time ozone data.

Soil-Based Risk Communication Study

Over the past few decades, blood lead levels in children have declined dramatically. However, lead poisoning remains a serious environmental health threat for children today. The legacy of lead-based paint and leaded gasoline will be with us for many years to come. Without further action, large numbers of young children will continue to be exposed to lead in amounts that could impair their ability to learn.

A project entitled, "Community Based Environment Lead Assessment and Education Demonstration Program," also know as the Lead Safe Yard Project[7] was a risk communication program that showed Boston residents low-cost techniques to reduce lead risks in soil. It was jointly sponsored by EPA's New England Regional Laboratory and several community partners in the Boston area: Boston University School of Public Health, Bowdoin Street Community Health Center, and two non-profit landscaping companies: Garden Futures, and Dorchester Gardenlands Preserve.

Other key objectives of this project were to:

- Develop an education outreach program to in form the community of the dangers of lead and reduce the risk of lead in and around the home.

- Demonstrate real-time delivery of data to residents to encourage future community-based lead in soil remediations.

The initial target community selected for this pilot project was the Bowdoin Street area, consisting of approximately 150 wood-framed, mostly older houses in the North Dorchester section of Boston. This is an inner-city community with a large minority and immigrant population, located in the "lead belt" of Boston, where the majority of children in the city with elevated blood lead levels reside.
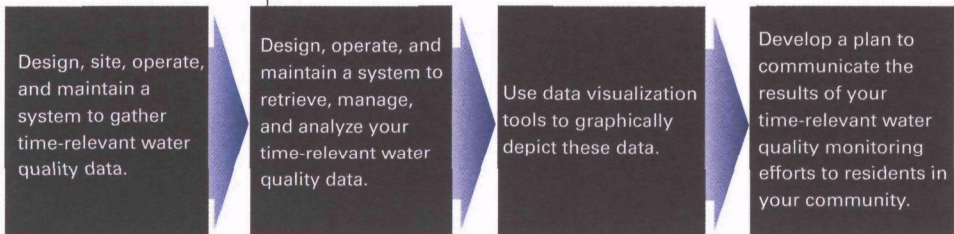
This project was funded in two phases that took place in the summer of 1998 and 1999. A free "tool kit" for homeowners containing helpful information on lead levels in the blood, what the different levels mean with regard to health risks, and important numbers to call to receive a free lead analysis in the home, was developed. Numerous seminars were conducted in different communities on lead-safe yard work. Outreach activities ranged from distributing flyers and knocking on doors, to speaking at community meetings. These efforts were culturally specific to the neighborhood and conducted at an appropriate literacy level.

Water-Based Risk Communication Study

The Lake Access Minneapolis Project[5] provided the public with time-relevant and historical water quality data for lakes within the largest, most populated watershed districts in Minnesota. This timely and accurate risk information about lake water quality helps community members make day-to-day decisions about lake use and lake issues. For example, information about fecal coliform levels can be used by swimmers to help decide when swimming is a health risk.

In order to make the project more effective, the EPA formed a partnership with the National Oceanic and Atmospheric Administration and the U.S. Geological Survey. The EPA worked closely with these federal agencies to help achieve nationwide consistency in measuring environmental data, managing the information, and delivering it to the public.

The Lake Access Project team used Remote Underwater Sampling System (RUSS) devices to collect time-rel-

evant water quality data from three locations involved in the project, to observe the way storms and other seasonal changes can affect the water and impact the fish and fishing, and to see how lakes and streams have changed with time.

| Design, site, operate, and maintain a system to gather time-relevant water quality data. | Design, operate, and maintain a system to retrieve, manage, and analyze your time-relevant water quality data. | Use data visualization tools to graphically depict these data. | Develop a plan to communicate the results of your time-relevant water quality monitoring efforts to residents in your community. |

Figure 6.⁴ Process of collecting, transferring, and managing time-relevant data. This process was used in the Lake Access Project.

Conclusion

Successful risk assessment and risk management involve effective risk communication. By effectively conveying risk information to the public, risk communicators can minimize environmental exposures and save lives.

It is important to develop ways of not only communicating in a clear, concise manner, but also determining how messages are perceived. In the real world, information communicated to reduce environmental risk must compete with the barrage of other messages communicated from outside sources. These outside sources can cloud a message and distort key information that is necessary for successful risk communication.

The public is becoming increasingly aware of the state of the environment and the possible health risks it may face. By developing partnerships with the concerned public, risk communication becomes the key resource for developing solutions that meet the needs of everyone involved, and minimize impacts on human health and the environment. The considerations identified in this digest help define a risk communication strategy for any agency.

Well-designed communication of risk information and careful attention to feedback will help to maintain the credibility of all environmental agencies involved,

and will help ensure that public values and concerns are incorporated into the decision making process. Effective risk communication helps environmental agencies and communities make good decisions.
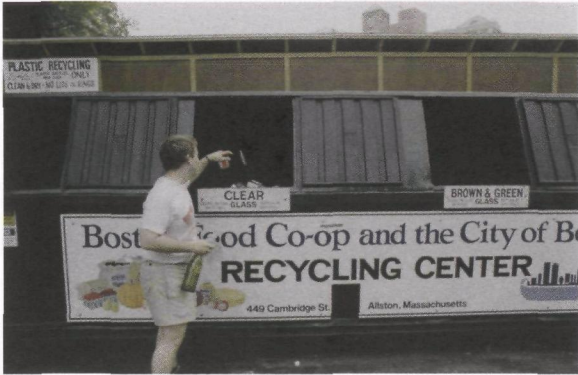
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